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Progress in Illuminating Engineering

THE opening meeting of the Illuminating Engineering Society, held at the E.L.M.A. Lighting Service Bureau on November 6th, was, as usual, devoted to a review of progress. Whilst there are again no very radical advances in illuminants or applications of light to record, constant progress in detail is being made, and the interest shown by members of the general public in illumination is continually extending. Mr. Dow's summary of progress during the vacation showed that this period has been by no means an idle one. There have been several events of considerable importance —in this country the very successful conference on public lighting, held at Sheffield in July, and abroad the International Illumination Congress, held in the United States: doubtless the most important conference on illuminating engineering that has ever been held.

The Illuminating Engineering Society itself made an enterprising new departure in the series of meetings arranged in Birmingham, Manchester, Newcastle and Glasgow, of which we give some account elsewhere. We believe that in some quarters a little doubt was originally entertained whether there would be sufficient local interest to justify these meetings. Actually the most sanguine expectations were more than realized. At Birmingham there was an audience of nearly 300; at Manchester, Newcastle and Glasgow the attendance was between 100 and 150, and in two cases the rooms were filled to their full capacity. In each case Mr. Cooper's paper gave rise to a good discussion, a feature of which was the series of useful contributions made by those from local universities. At Birmingham the discussion was opened by Professor W. C. Cramp; at Newcastle by Professor Thornton, of Armstrong College; while at Glasgow Professor Magnus McLean presided, and Professor Howe and Professor Parker Smith, of Glasgow University, joined in the discussion. The Society was especially honoured at Newcastle, where the Rt. Hon. Sir Charles Parsons presided, travelling up from London specially for the purpose. The thanks of the Society are also due to those associated with local electricity supply undertakings and lighting service bureaux, who aided very considerably in making the arrangements for these meetings.

We sincerely hope that these initial meetings in provincial cities will be followed by others. It is as yet too early to consider the formation of local branches, though we hope that this will be found possible in the future; when such a time does arrive we have no doubt that the experience will be similar to that in London, namely, that the Illuminating Engineering Society has a field of its own and does not compete with the activities of other bodies, but, on the contrary, is able to help them in many matters of common interest.

In the meantime the first step is to build up a nucleus membership in these provincial cities, so that the Society may have friends in every quarter who will keep it informed of what is happening in their area, and will themselves be kept in touch with events taking place elsewhere. In the opening addresses delivered at these meetings it was explained that the Council had in view a special arrangement for the benefit of members residing at a distance. We are now enabled to announce that in future applicants residing more than 50 miles out of London will have the option of joining, either

(1) as full members, paying the usual subscription of £2 2s. per annum, or

(2) as country members, under the same conditions as those applying to associates, i.e., the payment of an annual subscription of £1 1s., the applicant having all the privileges of membership except those of voting or being eligible for office.

We hope that this concession will pave the way for an extension of membership in the provinces, and that the Illuminating Engineering Society will have the pleasure of welcoming many adherents from the four cities visited.

Another new departure, the invitation extended to leading bodies and firms interested in illumination to become "sustaining members," has also had encouraging results. Although the idea was only launched a few months ago, the Society has already enrolled over 20 sustaining members, and we have every expectation that the number will progressively increase. The principle is a new and important one. The formation of this body of sustaining members will naturally aid the Society financially. But it has another, and equally important, object—in giving the Society the backing of all the chief firms and associations concerned with illumination, so that it can speak on their behalf and will know where to turn for information on any subject. The scheme is, in short, only another phase of the guiding policy of the Society, which is to secure the representation of all aspects of illumination, and all bodies able to share in its efforts.

This leads us to refer to one other important

item at the opening meeting of the Society—the announcement by the President, Mr. Clifford C. Paterson, that the next session of the International Commission on Illumination should be held in England. In many ways this country is fortunately situated to serve as the meeting place of such a congress. Geographically it is convenient. It has also, as Mr. Paterson remarked, the advantage that practically all the bodies interested in lighting matters are closely interlinked. Many of those who take an active part in the work of the National Illumination Committee, the committees of the B.E.S.A. concerned with lighting problems, and the Illumination Research Committee are also leading members of the Illuminating Engineering Society, which acts as a "liaison officer" correlating their activities. Furthermore, the Illuminating Engineering Society and its journal have, from their commencement, taken an international outlook in matters of illumination. The Illuminating Engineering Society has on its list nearly 100 corresponding members all over the world, who are kept in touch with its work and contribute information on local developments.

All these circumstances should aid in securing the co-operation of all those whose help would be desirable in order to render an international congress on illumination in this country a complete success. We feel sure that all would unite in giving our visitors a right royal reception.

The Costs of Accidents due to Inadequate Lighting

A SUGGESTIVE paper recently read by Mr. R. E. Simpson before the Illuminating Engineering Society in the United States analyses the costs of accidents resulting from inadequate lighting. Mr. Simpson is known as the originator of perhaps the most detailed analysis of industrial accidents in relation to lighting that has yet been made—that conducted by the Travellers Insurance Co. He has previously expressed the view that roughly 15 per cent. of industrial accidents are attributable directly or indirectly, to inadequate lighting. In the United States this proportion would correspond to an annual loss of nearly £400,000,000—a sum in excess of the entire income of the light and power companies in that country. In the present paper he emphasizes the importance of the indirect and largely hidden losses resulting from accidents which are not insurable. Records of the above insurance company suggest that these may often be as much as four times the value assessed for compensation claims.

Reference is made to a case in which the lighting scheme of a large factory was remodelled. The contract for the electrical work was about £1,000, and the annual lighting bill increased from about £400 to £900. But the number of accidents dropped from 475 to 170 per year, and the compensation payments from about £3,000 to £1,200—so that, regarded from this standpoint alone, the change was well worth while.

As an example of hidden losses, the author gives an instructive analysis of events. A large commercial building was awaiting occupation. A large machine, essential for the operation of this building, was damaged at the works by impact with a casting being conveyed by an overhead crane. The cost of repair, together with the penalty for not delivering the machine on time, came to about £3,700. Owing to failure to install this machine the new building was not ready for occupancy at the specified time. Some leases were cancelled outright; other prospective tenants had to seek temporary quarters, with consequent interruption of routine and transfer of office equipment. In these ways a further loss of £2,400 was involved. The uninsurable or incidental costs of the accident were therefore in excess of £6,000, whereas the only direct payment was a medical fee of 12s. for dressing a slight cut received by a worker at the time of the accident!

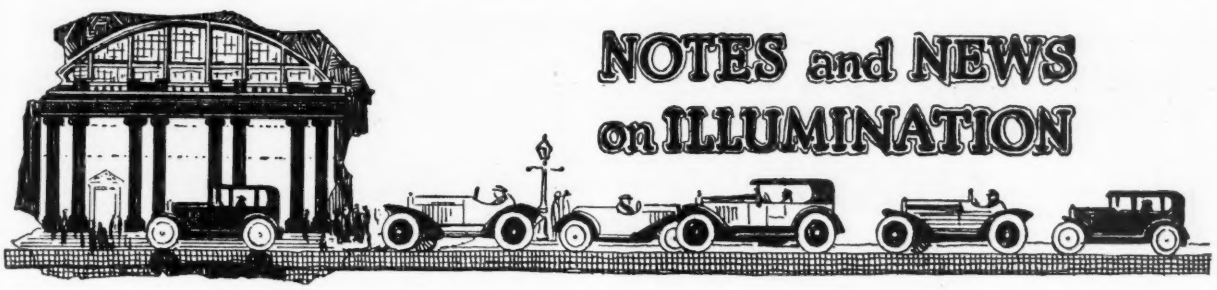
The lighting installation in the works where the accident to this machine occurred was obviously faulty, and observation from the craneman's cab showed that he could not see the obstruction in his path. The installation has since been remodelled. Had this been done earlier, in all probability the expensive accident described above would never have occurred.

A New Tendency in Illumination Design

THE advent of the gasfilled lamp gave a definite encouragement to the concentration of light in fewer and more powerful sources, and to the substitution of what may be termed the bowl type of unit in place of the chandelier. In private houses, offices and public buildings this mode of lighting has become very general. The chandelier, in its worst aspect—a multiplication of inefficient and exposed bright sources—is becoming a thing of the past, though it is still retained in special cases where lighting fittings are required to conform to the "period" of an interior. We do not say for a moment that illuminating engineers should disregard this mode of lighting, which expresses a definite and legitimate point of view, namely, the creation of the peaceful atmosphere of a more leisured age, which to some comes as a refreshing contrast to the bustle of the present day. Yet modern rooms demand modern methods of lighting and a degree of illumination considerably higher than is usual in the case of "antique" design.

The introduction of the bowl-type fittings (and in this class we include units of the diffusing totally enclosed type which are now so widely used) has served one obviously good purpose in concealing the source completely and considerably reducing the possibility of glare. But there are signs that this mode of lighting is only a transition stage and that the illuminating engineer, having evolved efficient implements, will concentrate more on "lighting as an art" in the future. It is perhaps a little singular that the first result of the exercise of this art may be the complete suppression of lighting fittings, as the term is generally understood. Pendant lighting units, which, after all, are excrescences, may be replaced by luminous artificial ceilings, panels and friezes. Not only the source but the subsidiary apparatus for directing its rays will be concealed. Conditions will comply with what is perhaps the best definition of a well-lighted room—one in which every object can be seen with ease without the observer being aware of the source of light.

This conception of lighting has recently made considerable headway in France, where some very pleasing and novel lighting installations have been evolved. Let it not be assumed, however, that the skill of the illuminating engineer and his implements will no longer be required. On the contrary, greater skill than ever will be needed in order to bring about these pleasing effects with a reasonable degree of efficiency. Their execution will involve the design of new apparatus based on the fundamental requirement—the scientific direction of light. The apparatus will, however, be less evident, and its use will be subservient to the general scheme of decoration.



Illuminating Engineering Society Forthcoming Events

The attention of readers is drawn to the NEXT MEETING of the Illuminating Engineering Society, which will be held at the E.L.M.A. Lighting Service Bureau at 6-30 p.m., on TUESDAY, DECEMBER 11TH. A paper dealing with the Use of Electric Light for Advertising Purposes is to be read by Mr. H. Lingard, and an interesting evening may be expected.

The attention of members is also specially directed to the ANNUAL DINNER, which has now been arranged to take place at 7-30 p.m. on WEDNESDAY, FEBRUARY 13TH, 1929. This dinner—the first held for some years—will serve to mark the fact of the Society attaining its twentieth anniversary next year. It is hoped that every member will make a special effort to attend and to bring as guests friends likely to be interested in the Society's work. Ladies will be invited. Further particulars will be announced in due course. Meantime will every member kindly make a note of the date.

I.E.S. Provincial Meeting

In this issue we are giving a full account, on pp. 342 to 346, of the first two special meetings organized in the provinces, which took place in Birmingham and Manchester. The proceedings at the last two meetings of the series, held in Newcastle and Glasgow, will appear in our next number, when we shall also be making a note on the gathering in Dublin on November 6th, which was addressed by Mr. J. Eck. It was generally agreed that all these meetings were must successful. We hope that they will serve their purpose in making the aims and objects of the Society more widely known and extending its list of members.

The Lighting of the Victoria Embankment

A discussion has been proceeding in *Municipal Engineering* on the lighting of the Victoria Embankment. The method of lighting this fine site has undergone considerable changes in the past. In a lecture before the London Society in 1914 the late Mr. L. Gaster quoted some interesting figures relating to the section between Westminster and Blackfriars Bridge. In 1882 the original lighting afforded 2,720 candle-power. In 1914 the combined lighting by means of flame arcs and incandescent lamps furnished 192,000 candle-power—over 60 times as much, but the total cost had risen only from 3s. to 10s. per hour. This is a tribute to the improvement in the efficiency of illuminants during the period 1882 to 1914, but we think we should probably be correct in suggesting that changes have been effected mainly by the substitution of lamps in existing positions, and that there has not been any radical departure in the in the design of the installation as a whole. The position affords a unique opportunity for a dignified and impressive bit of public lighting, such as we could show to visitors with pride. We agree with Mr. Haydn T. Harrison's contention that closer spacing is necessary to give the order of illumination demanded by important thoroughfares of this class, and at the same time to avoid glare. We imagine that a site such as this would be illuminated in the United States on the "white-way" principle, i.e., by relatively closely spaced ornamental standards equipped with clusters of lamps in diffusing globes; this would give an impressive effect when viewed from the bridges.

The International Commission on Illumination

SOME NOTES ON THE MEETING AT SARANAC INN, U.S.A.

The series of papers and reports presented at the congress in the United States (of which a list was given in our last number) was so numerous that it is difficult to give any adequate account of the proceedings. We hope in coming issues to touch upon the contents of some of the most interesting papers and discussions, and we understand that the complete proceedings will be published officially in due course.

Meantime readers may be referred to a brief but useful survey in *World Power* (November, 1928). The number of visiting delegates was very satisfactory. Two countries, Brazil and Sweden, were represented on the Commission for the first time.

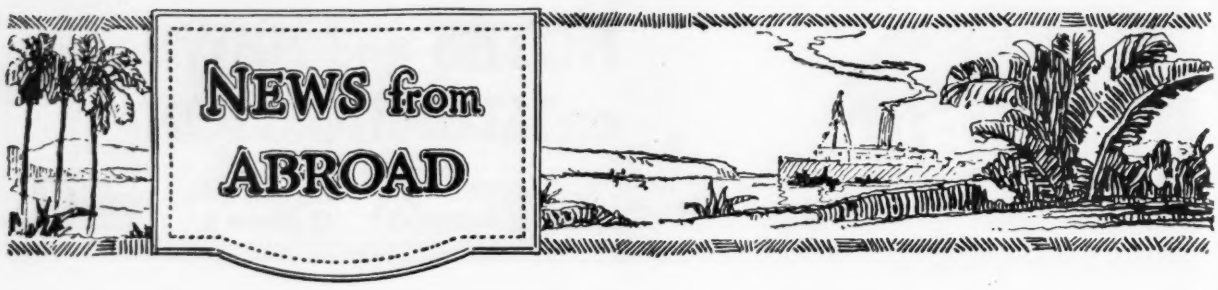
A few leading points may be singled out for special mention. We gather that, in regard to street lighting, Continental delegates were generally in favour of prescribing average illumination, whilst the British Committee preferred the minimum value. Much time was occupied in the discussion of factory lighting, and it was pointed out that the Geneva Code (now to be termed the "Code of the International Commission on Illumination") is not yet being very widely applied. One other point discussed of very great importance was the training of men for illuminating engineering. In most countries, with the exception of Germany and the United States, training is of a very casual character. In Japan and the United States the Illuminating Engineering Society is in charge of all activities.

The President, Mr. C. C. Paterson, was unanimously elected for a further term of office, and Dr. J. W. T. Walsh was elected Hon. Secretary. The invitation of the British Committee to hold the next session in Great Britain in 1931 was gratefully accepted.

The Cost of Light

It has frequently been pointed out that light is one of the very few commodities which costs very much less than it did a century ago. We believe it is a fact that the cost of bread to-day is almost the same as in the days of Queen Victoria, whereas artificial light is very much cheaper. Consumers have, in fact, derived progressive benefit from the series of inventions which has resulted in much more efficient illuminants. In the report presented at the opening meeting of the Illuminating Engineering Society last month attention was drawn to recent reductions in the price of lamps, the diminution being in some cases as much as 60 per cent. as compared with 1918. Gas and electricity supply undertakings, in some cases, have also been able to lower their charges substantially during the past year. Nevertheless we have no doubt that makers of lamps and fittings appreciate the desirability of effecting still further reductions, if possible. Appliances furnishing artificial light are tools essential in every industry, and the more cheaply they are produced the more generously they will be utilized.

We are informed that Mr. C. H. Woodward, Borough Electrical Engineer, has been appointed Public Lighting Superintendent and Gas Examiner to the County Borough of Bournemouth, in the place of the late Mr. N. Wright, who was President-elect of the Association of Public Lighting Engineers. Mr. Woodward is a member of the Association. He still retains his electrical appointment.



Illuminating Engineering in Germany

We notice that at the meeting of the German Illuminating Engineering Society, on November 8th, Dr. A. Meyer presented a report on the proceedings at the International Illumination Congress in the United States, which will doubtless be the subject of discussion by other bodies. Another item on the programme was a paper by Dr. W. Voege describing a new form of universal illumination photometer. The gathering of the German Society of Glass Technology, held in Berlin during November 15th to 17th, was the occasion for a variety of topics to be discussed. Most of these were of a technical nature, but in accordance with the the judicious method not infrequently followed in Germany, an opportunity was found to discuss hygienic aspects, as a paper reviewing precautions desirable in the interests of the health of glassworkers was read by Professor Dr. G. Keppeler. The "Lichtfest" in Berlin, which has aroused general interest, seems to have quite satisfied the expectations of those responsible. Special attention is drawn to the lighting of the famous street of Unter den Linden. Floodlighting of important buildings seems to have played the chief part in the proceedings. The example of Berlin has been followed by quite a number of German cities. Göppingen, Flensburg, Zittau, Leipzig, Hamburg, Stuttgart, Essen and Kiel are among the other cities mentioned as having organized special lighting displays.

Action Studies of Moving Machinery made with Neon Lamps

We notice that the *Utility Bulletin* has recently described the application of intermittent light from neon lamps to enable the action of fast-moving machinery to be apparently slowed down and studied in detail. The method is based on the stroboscopic effects observed when the period of moving objects approximates to that of the fluctuations in the light illuminating them. The "stroboscope," based on this principle, may be applied even to the most rapidly moving machines. One form, the "stroborama," furnished 1,000 candle-power, and enables a machine to be viewed in its entirety. The selection of the neon lamp for this work is due to the fact that only in the case of sources using luminous gases and vapours can instantaneous stoppage and lighting-up be secured. Some of our readers may recall a most fascinating demonstration of such apparatus by Dr. J. F. Crowley before the Illuminating Engineering Society a few years ago, and we understand that he has kindly promised to give a further display later in the present session.

A 50,000-Watt Incandescent Lamp

It is stated in the *Transactions* of the Illuminating Engineering Society (U.S.A.) that a new 50,000-watt incandescent lamp, constructed at Nela Park, was recently exhibited at Cleveland. This new lamp naturally created a stir. It is of the gasfilled tungsten type, with a tall chimney-like extension of the bulb, on which is mounted a number of radiating discs to dissipate the heat. One rather wonders how far lamps of this huge power can be expected to become a practical proposition, and what purposes they will serve. But, in view of the technical difficulties involved in the construction of lamps of even 5-kw. capacity, the manufacture of this monster is certainly a remarkable feat.

Fundamental Principles in Lighting

The serial article on the above subject that has recently been appearing in *Lux* illustrates the fact that illuminating engineers in France are pursuing educational methods not unlike those familiar in this country. There are several effective pictures illustrating good and bad lighting methods in the factory, and the device adopted to demonstrate the evil effects of glare—the exhibit of a lettered designs equipped with a central aperture behind which glaring objects may be inserted—has also been used here. A contribution by M. Sabino illustrates some of the novel decorative lighting devices in pressed glass that are being developed in France. Single units may assume spherical, cubical or other special shapes, but we think that the best instance of the application of these methods is to be found in the picture of a doorway outlined by a border of diffusing glass, behind which lamps are concealed. The selection of glass for such designs obviously needs care. It may or may not be desirable that the brightness should be uniform, but certainly the effect should not be "spotty"—a condition characterizing some installations of this type that have recently come within our notice.

Recent Events in Austria

Readers may be interested to note that the proceedings of the Illuminating Engineering Society in Austria are reported in "Die Lichttechnik," a special supplement to *Elektrotechnik und Maschinenbau* (Vienna). Recent papers read before the Society include a review of the application of the incandescent lamp to projection problems (floodlighting, kinema projectors, lighthouses, etc.), by Dr. L. Bloch, a description of various industrial lighting installations by F. Reiter, and a contribution dealing with asymmetric Holophane street lighting by A. Krautmacher. It is interesting to observe from Herr Reiter's paper the attention being paid to the use of indirect lighting for office work, especially drawing offices. The lighting units illustrated are of the enclosed type, the hemisphere below being of diffusing glass, and the neck above clear; by giving the requisite coloration to the glass this form of unit can readily be designed to yield artificial daylight. In *Lichttechnik* there is also an account of the part played by lighting in an exhibition ("Die technisches Stadt") organized in Dresden this year. One very singular item is the erection of a building that is approximately spherical in shape, stated to be the only one of its kind in the world, the exterior of which lends itself to special lighting devices.

A Lighting School in São Paulo, Brazil

The first lighting course ever held in Brazil took place in São Paulo last April, and an account of the proceedings to be found in a recent issue of the *Transactions* of the Illuminating Engineering Society (U.S.A.). It is stated that at no time during the course did the attendance fall below 80, in itself an encouraging result. The choice of subjects followed familiar lines, but it is interesting to observe that local lighting experts were apparently responsible for the lectures. As over a dozen different subjects were dealt with, this fact speaks well for the development of illuminating engineering in Brazil. Mr. J. P. Youtz, the Director of the School, is also the local representative of the American Illuminating Engineering Society.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

Progress in Illuminating Engineering

(Proceedings at the Opening Meeting of the Illuminating Engineering Society, held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C., at 6-30 p.m. on Tuesday, November 6th, 1928.)

THE opening meeting of the Illuminating Engineering Society was held at the E.L.M.A. Lighting Service Bureau (15, Savoy Street, Strand, London, W.C.), on Tuesday, November 6th. Members and friends assembled at 6-30 p.m., when light refreshments were provided, and the meeting commenced at 7 p.m.

In the unavoidable absence of the President for the past session (Mr. D. R. Wilson), Mr. J. S. DOW opened the proceedings. After the minutes of the last meeting had been taken as read the names of the following new applicants for membership were presented:—

Ordinary Members—

Easter, F. W.....Manager, Electric Department, Messrs. Haycraft & Son Ltd., Broadway, London, S.E.

Golds, G. W.....Technical Assistant, Engineers' Lighting Department, The Southern Railway, 133, Fishponds Road, Upper Tooting, London, S.W.17.

Love, C. J.....Lamp Inspector, Gas Light & Coke Co., 68, Bromley Road, Leyton, London, E.10.

Hilton, E. A.....Electrical Engineer, 1, Cross Road, Chorlton-cum-Hardy, Manchester.

Kates, S.....Manager of the Fittings Department, General Electric Co. Ltd., 71, Waterloo Street, Glasgow.

Owen, A. H.....Manager of the Manchester Branch of Cryselco Ltd., "Glenway," Golborne Road, Newton-le-Willows, Lancs.

Prince, D.....British Thomson-Houston Co. Ltd., 2, Langdon Road, Bromley, Kent.

Ridge, C. H.....Metallurgical Engineer, 57, Stanhope Gardens, S.W.7.

Smith, M. E. Wood....Director of Dakol Ltd., 39, Victoria Street, S.W.1.

Student, E.....Manager, Dualite Ltd., 18, Bartlett's Buildings, London, E.C.4.

Winch, G. T.....Research Laboratories of the General Electric Co. Ltd., Wembley.

Wood, T. Spencer.....Architect, 57, Colmore Row, Birmingham.

Associate—

Gostt, A. W.....Technical Assistant, Metro-Vick Supplies Ltd., 155, Charing Cross Road, London, W.C.2.

Sustaining Members—

Messrs. Benjamin Electric Ltd., Tariff Road, Tottenham, London, N.17. (*Representative*—Mr. T. F. H. March.)

Messrs. The British Thomson-Houston Co. Ltd., Crown House, Aldwych, London, W.C.2. (*Representative*—Mr. H. A. Lingard.)

Messrs. Cryselco Ltd., 231, Strand, London, W.C.2. (*Representative*—Mr. W. F. Moir.)

Messrs. The Engineering & Lighting Equipment Co. Ltd., Sphere Works, St. Albans. (*Representative*—Mr. G. J. Wells.)

Messrs. The Forward Electric Co. Ltd., Perry Bar, Birmingham. (*Representative* — Mr. W. Harrison.)

Messrs. The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2. (*Representative*—Mr. R. C. Walker.)

Messrs. Hailwood & Ackroyd Ltd., Morley, Leeds. (*Representative*—Mr. H. E. Butcher.)

Messrs. H. Jenkins & Sons Ltd., Unity Works, Vittoria Street, Birmingham. (*Representative*—Mr. G. Kendall.)

Messrs. Korting & Mathiesen Electrical Ltd., 711, Fulham Road, London, S.W.6 (*Representative*—Mr. C. Niepmann.)

Messrs. Metro-Vick Supplies Ltd., 155, Charing Cross Road, London, W.C.2. (*Representative*—Mr. G. Franklin.)

Messrs. Philips Lamps Ltd., 154, Charing Cross Road, London, W.C.2. (*Representative*—Mr. F. H. Spotswood.)

Messrs. Regants Ltd., 17, Shepherd's Bush Green, London, W.12. (*Representative* — Dr. J. Ferminger.)

Messrs. Siemens Electric Lamps & Supplies, Ltd., 38, Upper Thames Street, London, E.C.4. (*Representative*—Mr. A. C. Looker.)

The Society of British Gas Industries, 56, Victoria Street, London, S.W.1. (*Representative*—Mr. F. J. Gould.)

Messrs. J. Stone & Co. Ltd., Oceanic House, Cockspur Street, London, S.W.1. (*Representative*—Mr. J. F. B. Vidal.)

Messrs. Strand and Electric Engineering Co. Ltd., 24, Floral Street, London, W.C. (*Representative*—Mr. L. G. Applebee.)

Messrs. Wm. Sugg & Co. Ltd., Ranelagh Works, Chapter Street, Westminster, S.W.1. (*Representative*—Mr. Philip Sugg.)

Messrs. The Sun Electrical Co. Ltd., 118, Charing Cross Road, London, W.C. (*Representative*—Mr. S. A. Coleman.)

Messrs. Tungsram Lamp Electric Lamp Works (Great Britain) Ltd., 72, Oxford Street, London, W.1. (*Representative*—Mr. R. Mayer.)

Messrs. The Welsbach Light Co., Ltd., 344, Gray's Inn Road, London, W.C.1 (*Representative*—Mr. R. Tempney.)

The names of applicants presented at the last meeting were then read again, and these gentlemen were formally declared members of the Society.*

Mr. DOW remarked that the response to the appeal for sustaining members had been most encouraging. The scheme was designed not only to improve the financial position of the Society but to give it the backing of all the leading firms and bodies interested in illumination, so that they would know where to turn for information on every possible aspect of lighting.

Mr. J. S. DOW then said that it was his pleasant duty to invite Mr. C. C. PATERSON, the President for the current session, to occupy the chair. Mr. Paterson had already been taking a very keen and active interest in the welfare of the Society. He felt sure that all present would agree that the Society was most fortunate in having Mr. Paterson as their President, and would join in giving him a cordial welcome. (Applause.)

Mr. C. C. PATERSON, who then took the chair, expressed his appreciation of this reception, and called upon Mr. Dow to present the usual review of events during the vacation.

* *The Illuminating Engineer*, July, 1928, p. 191.

A Summary of Progress During the Vacation

By J. S. DOW

It is customary, at the opening meeting, to present a brief report of progress during the vacation. As in previous years, there is much of interest to be recorded, and the vacation period has been by no means an idle one. Work has been proceeding in connection with the various matters discussed at the annual general meeting in June last. One of the chief points that has been occupying the attention of the Council is the increase in the membership of the Society. It is gratifying to note that since the annual meeting quite a number of applicants have come forward. There has also been an encouraging response to the appeal for " sustaining members," who already number 23, and it is hoped that further additions to the list will be made shortly.

The Society has, however, sustained a loss in the early death of one of its promising young members, Mr. Harold John Hall, Chief Engineer and Manager of the Street Lighting Apparatus Company, who passed away on October 4th.

The intervening period since the annual meeting has been utilized to consolidate still further the financial position of the Society, in which direction steady progress is being made. The Society has met all expenses incurred to date, and has now a useful balance to its credit, though, in view of the expected progressive extension of the activities of the Society in future years, we are all anxious to do still more towards putting the Society on a sound financial basis.

Amended Constitution.—The Council has been occupied with other important matters. A draft of the proposed amended constitution has been prepared, and is now being considered with a view to presentation to members of the Society, following which the question of obtaining Articles of Association and making the Society an incorporated body will be considered.

Another matter which was raised at the annual general meeting, and has received careful consideration, is the time of the meetings. It is believed that the arrangement adopted for the opening meeting, i.e., to provide light refreshments at 6-30 p.m., with a view to commencing the meeting at 7 p.m., is probably the most convenient that could be devised, but the Council will be glad to hear the views of members on this point.

Programme for the Session.—An attractive series of papers has been arranged for the coming season, and it is hoped that these events will be supplemented by visits and informal discussions. It is of obvious importance to the future of the Society to obtain attractive and original papers, presenting information which cannot readily be obtained elsewhere, and the Council have in view a project which it is hoped will be helpful in this respect. Members will recall that in the annual report of the Council expression was given to the general desire that some form of a special fund should be raised to commemorate the services of the late Mr. Leon Gaster, Vice-President, Hon. Secretary and Founder of the Illuminating Engineering Society. The exact arrangements will be entrusted to a special committee formed for this purpose, and further details will be presented in due course.

The Society will attain its twentieth anniversary next year. This fact lends special interest to the annual dinner of the Society, which has been provisionally fixed for February 13th, the anniversary of the founding of the Society. Arrangements for this dinner will likewise be made by a special committee.

Meetings in Provincial Centres.—A new departure was made during the latter part of October—the holding of a series of meetings at leading provincial centres. These meetings were intended to serve a double purpose: to stimulate interest in the subject of industrial lighting, and to bring the work of the Society before the notice of people in the North of England with a view to extending the membership of the Society in these areas. It has been felt for some time that an increase in membership commensurate with the importance of its aims and objects could only be secured by extending the activities of the Society to other centres besides London, with a view to the ultimate establishment of branches in the important provincial cities. The experience at the opening meeting held in Birmingham on October 22nd was highly encouraging. The meeting was held in the Assembly Rooms of the London Chamber of Commerce, and Mr. R. A. Chattock, M.I.E.E. (City Electrical Engineer of Birmingham), presided. An introductory address was delivered by Mr. D. R. Wilson, following which Mr. J. L. H. Cooper read his paper entitled " An Investigation of Electric Lighting in the Engineering Industry." There was an attendance of nearly 300, and the paper excited much interest and gave rise to a good discussion. As a result of this meeting, additions to our membership in Birmingham will doubtless be made, and it is hoped that the experience will be similar in the cities of Manchester, Newcastle, and Glasgow, where meetings are also being held.

(This report was necessarily prepared before the three final meetings had taken place. Mr. Dow also gave a brief account of the gatherings in Birmingham, Manchester, Newcastle and Glasgow, at which expectations were more than realized. A full account of the proceedings at the first two of these provincial meetings will be found on pp. 342-346.

This does not exhaust the efforts that have been made to arouse interest in the work of the Society in different parts of the British Isles. By the enterprise of one of the members of the Council, Mr. Justus Eck, a meeting is being arranged in Dublin on November 7th, when Mr. Eck himself will give an address on the subject of Illumination. It is hoped that this meeting will also be helpful in making the work of the Society known in the Irish Free State, and that we shall in due course make additions to our membership in that country, where the opportunities for development seem specially promising.

Experience in connection with these provincial meetings has served to emphasize one other important question: the expediency of granting a lower rate of subscription to members who are resident a considerable distance from London, and are, therefore, for geographical reasons, unable to take full advantage of the privileges which the Society offers. This is a matter which was brought before the attention of the Council last session, and it is hoped to devise an arrangement whereby those who reside at a distance may rank as " country members," paying a reduced subscription.

Conference on Public Lighting in Sheffield.—An important event during the vacation was the holding of the fifth annual conference of the Association of Public Lighting Engineers, which took place in Sheffield during July 9th–12th. This gathering, which was attended by a considerable number of members of the Illuminating Engineering Society, proved to be exceedingly interesting and successful. Papers were read by Messrs. E. Horstmann and E. E. Sharp (" Non-Manual Control of Public Lighting "); Councillor F. Thraves (" What the Public Want from a Street-Lighting Department as Pedestrians, as Motorists, as Ratepayers "); Mr. J. M. Waldram (" The Visibility of Objects in Artificially Lighted Streets "). The address of the President, Mr. J. F. Colquhoun, was devoted to the series of experimental street-lighting installations, fifty in number and occupying something like eight miles of streets, which were arranged under his supervision in order to illustrate the practical operation of the British Standard Specification for Street Lighting. The inspection of the series of installations was supplemented by a series of special tests of illumination, glare and visibility, in which visitors took part. The records thus obtained should prove of considerable value in the future of phrasing the effects of different systems of public lighting. The conference was of special interest in view of the growing recognition of the importance played by public lighting in relation to traffic and accidents. The official report since issued on this subject shows that the number of accidents in streets in England and Wales during the past year was 139,831, and there is evidence that the proportion of accidents occurring by night has tended to increase during recent years.

Industrial Lighting.—The annual report of H.M. Inspector of Factories again contains numerous references to the subject of industrial lighting, the importance of which is strongly emphasized. A feature of special interest in this report is the account of a survey conducted by Miss Combes in cotton and woollen mills and by Mr. Shopland in engineering, motor-cars, cycles, boots and shoes, and other special industries. On the whole, the experience of inspectors of factories supports the view that there has been a steady progress in industrial illumination during recent years, though clearly there is still great scope for improvement. The moment is opportune for the factory-lighting campaign planned by the Electric Lamp Manufacturers' Association (Great Britain) Ltd., and conducted by the British Electrical Development Association which is now in progress. There can be no doubt that this widespread campaign will have material influence on factory lighting and will have most useful results. Experience at the special meetings arranged by the Society in Birmingham, Manchester, Newcastle and Glasgow also served to show the wide interest that is being taken in the subject of factory lighting. There is a general recognition of the importance of this subject and a desire to understand more of the conditions governing the provision of adequate illumination for various industrial processes.

The International Illumination Congress.—The most important event abroad has been the holding of the International Illumination Congress in the United States, which was attended by the President-Elect (Mr. C. C. Paterson) and a number of other members of the Illuminating Engineering Society. It is hoped that Mr. Paterson will be able to present some account of his experience at the opening meeting on November 6th; but meantime it may be pointed out that this congress is one of the most important that has been held in connection with illuminating engineering. It was attended by representatives from leading countries all over the world, and approximately 100 papers, reports, etc., were presented. The proceedings included three distinct parts—the tour of leading American cities, the convention of the Illuminating Engineering Society (U.S.A.) in Toronto, and the session of the International Illumination Commission held at Saranac, N.Y. Delegates who have returned from the United States speak with enthusiasm of their very interesting and enjoyable experiences, of which more will doubtless be heard shortly.

There have been other indications of the growth of interest in illumination abroad. The Société Française des Electriciens made an enterprising departure by arranging for a series of reports reviewing progress in different fields of lighting. A number of papers dealing with photometry and illumination were read at a recent Electrotechnical Conference in Leningrad, and considerable interest has been excited by the Festival of Lighting in Berlin, which involved a conjoint effort by local authorities in the lighting industry to demonstrate to the public the possibility of artificial light. During the period of the festival many important buildings in Berlin were floodlighted, and it seems likely that this new departure will be followed in other cities.

Another noteworthy development, illustrated especially in France, is the increased attention paid to decorative and architectural aspects of lighting. Novel lighting schemes based on the use of luminous artificial ceilings, panels and friezes have been devised, and it seems likely that such methods will be developed more widely in this country in the near future.

This brief account may serve to show that the past few months have been characterized by special activity in the lighting field. There is every indication that interest in illuminating engineering is increasing progressively throughout the world.

The PRESIDENT then gave a brief address dealing with the International Illumination Congress, which had been held in the United States, dwelling upon the wonderful hospitality shown to visitors and the enthusiasm shown by everyone concerned.

Some Notes on the Meeting of the International Commission on Illumination in the United States

By CLIFFORD C. PATERSON, O.B.E. (President)

THE Hon. Secretary suggested that I should speak for a few minutes on the United States and the meeting there, from which we have just returned, of the International Commission on Illumination, an organization founded in 1900, and supported both financially and influentially by this Society. The secretariat of the International Commission is in England, Dr. Walsh being Hon. General Secretary. Let me say, first of all, that the visit proved more successful than the most sanguine expectations of any of its promoters, and this for several reasons.

Our friends in the United States, who had made magnificent preparations for the visit, had laid great emphasis on the desirability of developing its dual aspect, i.e., to make it an open *Congress* at which illuminating engineers from every country could meet to exchange views and experience, as well as what it has mainly been heretofore, a meeting of countries, each officially represented, at which international agreements and recommendations could be formulated. This was regarded by most of us as a natural step in the evolution of the International Commission, and the delegates unanimously approved it, with the proviso that at our meetings the two functions should be kept distinct.

They were, on the whole, kept distinct in America, although certain lessons were taken to heart for future application regarding the restriction of papers at the official international technical sessions to those phases of the subject which bear directly on the international recommendations which happen to be under consideration. What one may call the General Congress Sessions were held in Toronto under the ægis of the Illuminating Engineering Society of America, and consisted of the Annual Convention of the I.E.S. of America, to which foreigners were invited. They lasted about four days, and gave opportunity for general discussion. The official international meeting took place the following week in a large hotel (Saranac Inn) out in the mountains, about 100 miles away, and lasted five days. All the official delegates from the different countries attended the first Congress at Toronto, and many unofficial Congress members attended at Saranac. Everyone was welcome at either assembly, only the character and the objects of the meetings differed. The arrangement proved an excellent one and, wisely developed to suit the circumstances of each country where a Congress may be held, will probably be taken as a model for future meetings. There were in all about 70 delegates from Europe, of whom Britain sent over 20.

I cannot let this opportunity pass without recognition of the splendid loyalty and team work of the British delegation through the entire tour. If I may, for a moment, strike a personal note, I would say, as President, that nothing could have been more helpful to me than the spirit in which its members entered into all the activities of the visit and the arduous work of the meetings themselves.

Prior to these sessions the delegates from Europe were taken by the American illuminating engineers on a fortnight's tour through the Eastern States, starting at New York, and including Boston, Philadelphia, Washington, Cleveland, Chicago, Detroit and Niagara. In all these cities there were many things of interest to the illuminating engineer, and special demonstrations had been arranged to exhibit them to us. It is hardly possible here to go into details of these, because I want, in these brief remarks, to speak of other aspects of the subject. You will, however, appreciate how valuable is such an experience when illuminating engineers from all countries are thrown together for several weeks in informal relationship for study, instruction and recreation. I

hope an opportunity will be found for some member of the British delegation to give the Society a full account of our experiences in the United States.

So much for one aspect of our visit. The second was the five-days meeting of the International Commission proper. Why was this such a success? For successful it was, without doubt. During most of four days we had either three or four parallel sections in session, and made effective progress with some 14 specific subjects. These were: Vocabulary, definitions and symbols, automobile headlights, heterochromatic photometry, street lighting, coloured signal glasses, diffusing materials, photometric test plates, light-flux distribution, colorimetry, photometric standards, natural lighting, photometric precision, cinema lighting. Some of them were found ripe for definite international agreement. In others the experts decided the line of study which must be followed before the next meeting in order that an international understanding might then be reached. You have only to examine the official statements and recommendations of the Saranac meeting, which shall be published, to appreciate the importance of an achievement which secures the agreement of eleven nations to definite recommendations or statements in 14 of the most important subjects in illuminating engineering. In addition to this we carried out a complete revision of the statutes of the Commission, which are now in a form which the delegation of each country is prepared to recommend to its National Committee.

These things were not achieved, however, merely by bringing people together. The ground had been prepared prior to the meeting. The dominant opinions in the different countries had been canvassed, and delegates had had opportunities in many cases of considering them before leaving Europe. This was the first fruit of the machinery of international secretariats set up in Bellagio last year, and which we are relying on to do even greater things between now and the next meeting in 1931. The meetings sat every day, with only a brief interval for lunch, from 9 a.m. to 5 or 6 p.m., and not one meeting started late.

And now I come to the chief thing I want to say. The British delegation extended an invitation to the Commission to hold its next meeting, or rather Congress, in 1931 in England. To start with we have never had a meeting in England of the Commission, whilst we have already visited all the other chief countries. Secondly, a tentative suggestion which your delegates made to this end was so warmly received by the other countries that I think you would have felt it was the right thing to do. Thirdly, everyone felt that England would make a good job of another combined *Congress* and *Plenary International Meeting*.

Now what should be the part of this Illuminating Engineering Society of London in the 1931 International Illumination Congress? It is for you to say, through your Council; but my view is that our Society would not only feel obliged but would wish to take a leading part in the duties of entertaining the foreign delegations who will attend the meeting, and that in all countries of the world it should be known that the Illuminating Engineering Society of London is, jointly with the British National Illumination Committee, the host of the Congress.

I do not think all our members appreciate how happily we are placed in this country from the point of view of organization of our illuminating engineering activities. The fact that our British National Committee and the Sectional Illumination Committee of the B.E.S.A. are one and the same personnel is a great simplification. The fact that almost all of the members of these committees are members of our Society, and desire the closest co-operation between the two, should make it easy for our Society to take its rightful place in this matter. It is certainly my sincere hope that my Presidency will see some vital bond established between all the forces which are working, each in its sphere, for progress in illumination matters, so that when those of us who are now bearing responsibility have retired in favour of younger and, I hope, better men, our successors may look back on our work and say that, in spite of our many faults, we at least handed on to them an organization based on sound statesmanship and a tradition of broadminded tolerance and co-operation.

And so I want to seize this first possible opportunity of taking the membership of the Society into partnership and let you know the position. For, if the 1931 Illumination Congress is to be a success, the 2½ years which lies before us is none too long a period for making preparations. Furthermore, I am quite sure that if an International Illumination Congress is to be held in England this Society will desire to take its proper place in connection therewith. The present time is not unpropitious, gentlemen, for our good friend Col. Edgcumbe, the President this year of the I.E.E., is also chairman of the B.E.S.A. Illumination Committee and of the British National Committee, and is a member of our Council. He, I know, will lend his support to any statesmanlike scheme which gives promise of continued smooth and harmonious interworking amongst the various influences in the field of illumination in this country.

The PRESIDENT then called upon Mr. J. W. Elliott to present the Report of the Committee on Progress in Electric Lamps and Lighting appliances.

Progress in Electric Lamps and Lighting Appliances

Report of the Committee of Progress in Electric Lamps and Lighting Appliances [Mr. S. H. Callow (Chairman), Mr. C. W. Sully, Mr. J. W. Elliott (Secretary), Mr. J. Y. Fletcher].

The depressed state of some of the basic industries of this country still hampers progress in electric illumination, but in spite of this fact it is satisfactory to report that the last twelve months has witnessed a steady improvement of the standard of illumination in all lighting fields, while the activities of investigators and efforts in lighting service have continued with unabated energy. It is still too early for the work of co-ordination in the generation of electricity as set forth by the Electricity Commissioners to be very appreciable in lighting circles, but substantial reductions in electricity charges for lighting purposes have taken place during recent years. The recent report of the Electricity Commissioners show that in the period 1921-2—1925-6 the average revenue per unit for lighting and domestic purposes fell by over 33 per cent., and during the present year many authorized undertakings have still further reduced their charges, perhaps one of the most noticeable being that of the Metropolitan Borough of Hampstead, where electricity for lighting costs only 3d. per unit on a flat rate.

Electric Lamps.—It can be confidently stated that at no period has artificial lighting been obtainable at such a low cost as at the present time. This is partcularly true in the case of electric lighting, for, simultaneously with the reductions in the prices of electricity, improved methods of manufacture have brought about considerable reductions in factory costs and improvements in lamp efficiencies. The former has enabled the price at which electric lamps are retailed to the public to be still further reduced, and it is gratifying to realize that this last price reduction means that the list prices of vacuum lamps are now 38 per cent. below 1918 prices, and in the case of gasfilled lamps of the popular sizes 60-watt and 100-watt prices are now 60 per cent. lower than in 1918. Lamps of improved efficiency are already on the market. The British Engineering Standards Specification dealing with electric lamps is undergoing revision, and it is anticipated that the figures of lumens values will be 5 per cent. to 10 per cent. higher than in the old specification. These two factors result in a great increase of candle-power hours for the same expenditure on lighting. In some instances, overall dimensions and light-centre lengths will have been modified to facilitate manufacture, and, in general, tolerances on efficiencies and dimensions will be tightened up. This will greatly assist lighting engineers in the design of lighting equipment and the preparation of lighting schemes.

The returns of lamp manufacturers again show a continued change-over from vacuum lamps to the more

efficient gasfilled lamps, and the fact that the gasfilled lamp can now be obtained at practically the same price as the less efficient vacuum lamp is accelerating this change.

Obscured lamps are now finding general favour, and since these lamps do so much to avoid glare we hope that they will in time supersede clear lamps for general lighting purposes where there is any possibility of the lamp being visible. The inside-frosted lamp, owing to its diffusing properties and to the fact that it can be obtained at the same price as the clear lamp, is largely used for domestic and commercial purposes, while white opal lamps are being increasingly used where the complete obscuration of the filament is desirable. The introduction, last year, of the modified ratings of electric lamps in the 15, 25, 40, 60, 75 and 100 watt sizes has been well supported by public demand, and considerable use has been found for the new 15 and 25 watt sizes. As a result, lamp manufacturers have been able to discontinue the manufacture of the old ratings of 10, 20 and 30 watts in standard lamps.

During the past year a number of supply stations have been able to effect changes in voltage, and to fall in line with the standard pressure authorized for the country for all new generating stations, namely, 230 volts; manufacturers look forward to more complete standardization of supply pressures, since this will bring about a reduction in the number of voltages for which lamps are made. A more general adoption of the standard voltage and some simplification of the types of lamps themselves would result in material savings in lamp production costs, with a resultant advantage to the consumer in the form of lower prices.

Some considerable development has taken place in the past twelve months in the production of large gasfilled lamps for special purposes. Perhaps one of the most important uses of these lamps is in connection with navigation lights in lighthouses and lightships. Here it is necessary to produce a lamp which will maintain a beam at its full brightness while it is visible, and then give place to absolute darkness, at the same time giving a compact focal source. A number of these lamps are now in use ranging up to 4 kilowatts loading, and operated from 80-volt supply. Not the least difficult problem in connection with the manufacture of these lamps is the problem of making a vacuum-type seal between the glass and wire which will be capable of carrying 50 ampères. Among the installations already using these lamps are the famous lighthouses at Pendeen, Lizard, Hartland, Burnham and Skerries. The introduction of these new gasfilled lamps has, in these instances, already proved beyond dispute that automatic control of lighting apparatus can be employed to yield reliable and economic results both in lighthouses and lightships.

The lighting of kinematograph studios is another field where these large gasfilled lamps are being introduced. The experiments are being very closely watched by many interests, and it is probable that the arc and vapour lamps, particularly for close-ups, will be superseded by the use of gasfilled lamps in appropriate equipment. The electric arc, in particular, when used for this purpose is bulky and emits fumes which considerably impair film production.

The introduction of the gasfilled lamps for kinematograph studio use has been made possible by the development of panchromatic films, and the combination of film and light source is bound to do much to simplify the technique of kinematography. Among the many advantages claimed are low initial cost, ease of repair, economy of light production, and better distribution of light in the beam.

Home Lighting.—Light as a decorative medium in the the home is being more and more appreciated, and new materials have been produced which give lighting fittings still greater utilitarian as well as decorative value. Settings of furniture displays in shop windows are nowadays invariably complete with lighted floor standard, table standards, or lighted ornaments, and the public is coming to regard these electrical accessories as an indispensable part of the furnishings of the home. It is, therefore, all the more unfortunate that so very few houses are equipped with wall plugs to which portables can be connected. Even on new buildings estates it is rare to find that the builder has arranged to provide plug points in the rooms, and since lighting seldom receives consideration until furnishing actually occurs, that is, after painting and wall-papering is complete, the new householder is usually doomed to a restriction of the convenience that is possible for the most modern of all illuminants. It is, therefore, opportune that the Electrical Association for Women is interesting itself in this question, and is at present engaged in an "Outlet" Campaign. This effort obviously requires fostering by all sections of the electrical industry.

Architectural Lighting.—This constitutes perhaps one of the most important recent advances in lighting, and involves very close co-operation between architects and electrical engineers in the design of the lighting arrangements. The origin of this movement can be traced to the Paris Exhibition of Decorative Art in 1925. There are already many magnificent installations on the Continent, while the movement is already gaining ground in this country. The feature most noticeable is the fact that lighting becomes such an integral part of the architecture that without it the architectural effect would be entirely marred. Lighted surfaces, either by reflection or transmission through diffusing media, constitute definite architectural elements in the design. Its lighting possibilities are almost unlimited, since the light source itself is either concealed or screened so that illumination is received from very large areas of low intrinsic brilliancy, and high intensities of illumination can be introduced without the slightest semblance of glare. In some instances, this new style of lighting takes the form of ceiling or wall units constructed almost entirely of frosted or opal glass in flat sheets or moulded glass embodying modern designs. In elaborate schemes the lighting equipment is built into the fabric during the construction of the building, although some fittings are designed to be applied to the completed ceiling or wall surfaces. In addition to finding application in hotels and restaurants, this new art in lighting lends itself to an entirely fresh conception of shop-window lighting. Up to the present we have almost entirely considered shop lighting in terms of light-reflecting equipment and lamps placed at the top front of the window, but some progressive shops have been quick to grasp the potentialities of this new method of lighting. The windows themselves are sometimes lighted from units between sections of flat glass suspended from the ceiling or behind glass valances, while the window frames and portals themselves are rendered luminous by the employment of small lamps behind glass panels. Again tremendous intensities of light can be introduced, providing a charming lighting effect entirely out of the common.

In general, this new lighting makes use of very many small lamps in the place of comparatively few larger ones. In view of the possibility of this form of lighting becoming popular in Great Britain, the Lighting Service Bureau of the E.L.M.A. is inaugurating an architectural department and so engaged the full-time services of an architect to make a complete study of the subject, while a large room is in process of being equipped so that this architectural lighting, in many of its forms, can be demonstrated to visitors. This room is sure to make a tremendous appeal to architects and those interested in this new method of illumination. The new lighting is likely to change fundamentally the illuminating engineers' outlook on lighting installations, and it is hoped that British lighting engineers will give a lead to this new and interesting development.

Factory Lighting.—At the beginning of this year, Mr. J. L. H. Cooper was able to report in a paper to the Illuminating Enginering Society the results of the survey made on the subject of "Lighting in the Engineering Industry," and it was obvious that vast numbers of the workshops and factories in this country were badly lighted.

During the last few years a tremendous amount of investigation work has taken place, and is available through the reports of the Chief Inspector of Factories and Workshops, the Department of Scientific and Industrial Research and the Industrial Fatigue Research

Board. This official data is being usefully employed by various interests; for instance, following the publication of the Government Typesetting Report, the Joint Industrial Council of the Printing Trades has issued health leaflets dealing with the importance of lighting, and its effect on output and as an aid to the preservation of eyesight. This year's report of the Chief Inspector of Factories and Workshops is very encouraging, for the question of lighting is given due prominence as follows:—

"Within recent years factory lighting has come to be recognized as a very important section of industrial hygiene, and the large amount of investigation and experiment that has taken place has established clearly that good lighting has a marked influence both on safety, health and comfort of the worker, and on the ease and efficiency with which the work can be done."

So much data is available nowadays on this subject that it was considered opportune to make a national effort for improving the lighting in factories and workshops, and with this end in view a lighting campaign, planned by the E.L.M.A. Lighting Service Bureau and conducted by the British Electrical Development Association, is now in progress.

In this campaign the following associations are co-operating:—

Electric Lamp Manufacturers' Association.

Cable Makers' Association.

Electric Light Fittings Association (Industrial Section).

Electrical Contractors' Association.

British Electrical Development Association.

The campaign is receiving the wholehearted support of the electrical industry. Amongst other activities, handbooks dealing with lighting in factories are being circulated to not less than 100,000 factories and workshops, and as many lecture demonstrations as possible dealing with the principles of good lighting are being arranged in order to ensure that at least one responsible person in every factory throughout the country is conversant with the advantages of modern lighting.

School Lighting.—Continued progress can be reported under this heading, for in some progressive schools totally enclosed units are being installed providing an even illumination throughout the classroom free from shadows or glare. The chief difficulty, however, lies in convincing education authorities that it is worth while expending a comparatively small sum of money to provide modern lighting equipment in order to protect the eyes of children, whose vision is so sensitive and likely to be impaired.

Street Lighting.—During last year, considerable improvements have taken place in the public lighting of a few towns. Perhaps the most outstanding installation is that of the Marine Parade at Brighton, where columns, each supporting two lanterns of diffusing glass incorporating a refractor and housing a 1,000-watt gas-filled lamp, are installed at intervals of 120 feet for a distance of 3 to 4 miles. Both the quality and the intensity of the illumination provided are of a very high order, and the effect is so successful that other seaside resorts are considering the installation of spectacular lighting of a similar character. There are now many towns and districts throughout the country in which the streets are entirely lighted electrically, for it is found that the ease of maintenance and control of electric street lighting considerably reduce the difficulties of public-lighting engineers.

The recent meeting of the Association of Public Lighting Engineers at Sheffield was one of outstanding importance. The City Engineer had found it possible with co-operation of manufacturers to install some 50 street-lighting installations fulfilling the requirements of the different classifications given in the B.E.S.A. Street-Lighting Specification. Most lighting engineers were convinced of the advantage to be accrued from increasing the mounting height of the lighting units. At the same time, the Department of Scientific and Industrial Research availed itself of the opportunity afforded by this unique array of street-lighting installations to carry out some tests on the question of glare, and it is hoped that the result of these tests will be available in the near future to assist engineers on this very difficult question.

The subject of street lighting occupied an important session of the Public Works and Roads Congress in November last, when it was shown to what a degree the nature of the road surface influences the resultant effect of lighting in producing visibility along a street. In another paper, dealing with "Street Lighting in London," attention was drawn to the need of co-ordination in street-lighting matters between contiguous districts, and to ensure that lighting receives attention when a new road is being constructed. Unfortunately, many of the arterial and by-pass roads lose at night much of their advantage due to the lack of satisfactory street lighting. Another feature is the increasing use of opal and inside-frosted lamps for street lighting with a view to reducing glare.

Traffic Signs and Signals.—Like street lighting, this question requires to be dealt with on broad lines, since a parochial outlook neglects co-ordination and standardization, which become so necessary in these days of modern transport. There is, at the present time, such a variety of traffic signs and warnings that the motorist is unable to readily recognize their purport until very close to them, and this difficulty is accentuated by the fact that the nature of these signs varies from town to town and county to county. In many areas, no attempt is made to light up traffic signs; in others, the signs are incorporated as part of the street-lighting equipment, invariably proving unsatisfactory as a sign, and limiting the value of the street lighting. If traffic signs are left unlighted, their effectiveness is lost during night-time—often the very period when they are most needed. Furthermore, the degree of brightness which is quite adequate in rural areas is completely unsatisfactory in city areas, where traffic signs have to compete with street lighting. These important questions received attention at a meeting of the Association of Public Lighting Engineers in February of this year, in an introductory paper by Mr. W. J. Jones.

An altogether different subject, no less important, is that of traffic control, and it is interesting to note that numerous experiments are being made in different cities to estimate the degree of traffic control which may be effected by illuminated traffic signals, either to supplement or in some instances to replace the control afforded by traffic officers.

The importance of these subjects may be gauged by the fact that the meeting called by the Association of Public Lighting Engineers was attended, in addition to its own members, by chief constables, county and borough surveyors, city engineers, representatives of the Ministry of Transport, and representatives of automobile associations. It is hoped that the subject of traffic signs and signals will receive more earnest consideration during the forthcoming year, and that at least an *ad hoc* Advisory Committee will be appointed to deal with such matters.

Lighting Fittings.—The British Engineering Standards Association Specification for Industrial Reflectors (Dispersive Type) is now being widely employed, and during the last year the issue of an important specification dealing with translucent glassware* (illumination fittings) affords another instance of the excellent work which the B.E.S.A. is doing in connection with illumination. In addition to dealing with such matters as diffusing power, brightness, luminous efficiency, testing and heat resistance, for translucent glassware, the specification contains an important section dealing with dimensions. The question of the relative dimensions of glassware, lamps and galleries is an important one, both to manufacturers and users of lighting appliances, and the tables given will ensure interchangeability of glassware and metalwork for totally enclosed fittings, bowl fittings, and shades.

Lighting Loads.—There are now many lighting installations where the load factor and units consumed compare favourably with power loads. Many shops and offices use electric light all day, summer and winter, and

* No. 324, 1928.

the lighting in some of the large stores and restaurants accounts for 100,000 to 1,000,000 units per annum.

Those of us in the lighting industry have always known of the importance of the lighting load as a revenue-producing medium, and are, therefore, encouraged by the Electricity Commissioners' comments in the latest returns of the engineering and financial statistics as follows:—

"The above analysis and figures . . . disclose the growing importance of the lighting and domestic load as a source of revenue, this class of supply accounting for over 51 per cent. of the revenue derived from the sale of energy to consumers in 1925-26 (the last available)." This being so, it would appear that the lighting load deserves much greater active development on the part of supply undertakings than is ordinarily given to it at the present time.

Lighting Service Bureau Activities.—The Evening Illumination Design Course held at London, Birmingham, Manchester, Leeds and Edinburgh in the autumn of last year was very successful. No less than 500 electrical engineers attended the course, consisting of eight lectures, and the Lighting Service Bureau is arranging for a similar course of six specialist lectures to be given this season.

The day course, held in May last, was the most ambitious yet attempted, being attended by 80 engineers throughout the whole period of a week. Delegates attended from all parts of the country and several came from Holland and Belgium.

The re-equipped demonstration rooms of the Lighting Service Bureau were used for the lectures, and much additional demonstration material was introduced, while the lectures themselves consisted largely of new matter based upon many of the important researches of this country. This educational work is of tremendous importance in promoting lighting development, and already there are hundreds of engineers in this country who have attended courses and are now alive to the possibilities of electric illumination.

The Provincial Lighting Service Bureaux in Newcastle, Glasgow and Manchester, which are operated and financed by joint committees representative of all sections of the industry, have also been actively engaged in the promotion of better lighting in all fields, and are becoming recognized centres for information on lighting matters in their respective areas.

In general, there appears to be a revival of interest in electric lighting matters, and since the appreciation of the value of good lighting is founded on such sound, practical and experimental evidence, we can look forward to the advancement of better lighting practice, in the near future, with every confidence.

Exhibits Illustrating Progress in Illumination

The PRESIDENT then explained that the remainder of the evening would be devoted to a series of exhibits and demonstrations, illustrating progress in illumination.

The first item was the exhibit of some novel types of illuminated signs by Mr. A. W. BEUTTELL. The chief feature of these signs was the utilization of reflection of light from the concave-glass window, whereby even illumination was obtained over the whole surface of the sign from lamps placed at one end only.

Mr. A. CUNNINGTON, who followed, described a method of lighting a section of railway track on the Southern Railway by means of a battery of acetylene flares—a novel and unusual feature being that the 28 burners used were supplied by piping from one or two generators. This device was found to be much more economical than if each flare had been supplied from its own generator.

Mr. G. TINGLEY exhibited two of the new 30-amp. "Dia" long-burning flame arc lamps, similar to those recently installed in Leipzig and other Continental cities.

Mr. L. E. BUCKELL showed a 10-kw. incandescent electric lamp suitable for the floodlighting of aerodromes, pointing out the many special problems that had been encountered in its design.

Mr. E. GREETHAM'S exhibit comprised "Pointolite" lamps ranging from 100 to 1000 candle-power and representative examples of resistance boxes for use therewith.

The next four demonstrations dealt mainly with photometric apparatus. Mr. E. STROUD exhibited the latest model of the Holophane lumeter, drawing attention to the wide range of illuminations (up to 2000 foot-candles) which could be measured. The instrument is now available in two forms, corresponding to the two ranges mentioned in the B.E.S.A. specification. Mr. G. HERBERT exhibited the Benjamin lightometer and Mr. E. RUSS the Philips foot-candle meter, both very compact and simple forms of instruments. In addition a demonstration of a new form of spectrophotometer was given by Mr. TIPPEL.

Another novel and interesting exhibit due to Capt. STROUD comprised specimens of the new series of prismatic Holophane plates, each 12 inches square but differing in design, and adapted for use in shop windows, hospital operating rooms, art galleries, etc.

Various new and pleasing forms of lighting fittings were shown in operation by Mr. F. L. CALVERT, Mr. H. IVES, Mr. A. W. ZELLEY and Mr. A. G. BLAKE, and Mr. C. T. PAYN showed several fittings illustrating the "Treph" lighting system, which utilizes a series of concentric rings of diffusing glass, and gives a very soft effect. Mr. H. IVES, Mr. PRICE and Mr. APPLEBEE showed some recently developed spot lights and projectors, and the latter also exhibited a new form of metallic dimmer, which presented interesting features.

The PRESIDENT, in closing the meeting, congratulated the exhibitors on getting through such a varied series of demonstrations in the prescribed time, and expressed the thanks of the meeting to the E.L.M.A. Lighting Service Bureau for their hospitality. On such occasions their unique arrangements for demonstrations proved extremely serviceable.

A special vote of thanks to authors and exhibitors was proposed by Mr. J. Y. FLETCHER, who remarked that this successful evening had served excellently to illustrate the rapid developments that were taking place in illuminating engineering.

On the motion of Mr. J. S. DOW, a cordial vote of thanks was passed to Mr. C. C. PATERSON for presiding, the speaker remarking that they looked forward to his taking the chair at many equally successful gatherings in the future.

Announcement of Next Meeting

In conclusion, the PRESIDENT announced that the **next meeting** of the Society would be held at the E.L.M.A. Lighting Service Bureau, at **6-30 p.m.,** on **December 11th, 1928,** when a paper entitled **"The Use of Electric Light for Advertising Purposes"** will be read by Mr. H. LINGARD.

(*A fuller illustrated description of these exhibits will be found on pp.* 348–358.)

Subscription for Country Members

We understand that the Council of the Illuminating Engineering Society has now decided, in accordance with Article 21 in the Constitution, to carry into effect the proposal previously mentioned in regard to terms of subscription for Country Members.

Under the new arrangement applicants residing more than 50 miles from London will have the option of joining either

(1) as full members, paying the usual subscription of £2 2s. per annum, *or*

(2) as "Country Members," under the same conditions as those applying to Associates (i.e., the payment of an annual subscription of £1 1s., the applicant becoming entitled to all the privileges of membership except those of voting and being eligible for office).

An Investigation of Electric Lighting in the Engineering Industry

Proceedings at the Special Meetings organized by the Illuminating Engineering Society in Birmingham, Manchester, Newcastle and Glasgow

AN enterprising departure this autumn has been the series of special meetings arranged by the Illuminating Engineering Society in Birmingham (October 22nd), Manchester (October 29th), Newcastle (October 31st) and Glasgow (November 1st).

These gatherings were intended to serve a double purpose—to create interest in better factory lighting and to make the work of the Illuminating Engineering Society more widely known. At each meeting a short introductory address was delivered by a leading member of the Society, and this was followed by the reading of Mr. J. L. H. Cooper's paper, entitled "An Investigation of Electric Lighting in the Engineering Society," which was presented before the Illuminating Engineering Society in London last session.*

At each meeting a good supply of copies of *The Illuminating Engineer* for January, 1928, containing Mr. Cooper's paper and the discussion in London, was available. Further copies of this issue had previously been circulated amongst possible speakers.

A pleasant feature at each centre was the arrangement by which the Chairman of the meeting, the author, and various engineers in the locality who had helped in organizing the meeting assembled to meet the members of the Society who had come up from London, and had a meal together prior to the meeting.

Birmingham, October 22nd

At the opening meeting of the series, Mr. D. R. Wilson, the President for the past session, had kindly undertaken to deliver the opening address. A small party gathered at the Grand Hotel to dine together at 6 p.m. Those from Birmingham included Mr. R. A. Chattock and Mr. W. Y. Anderson (Birmingham Electricity Supply Department), Mr. Marsh (Birmingham Gas Department), Professor W. C. Cramp (Birmingham University), and Mr. F. Boyes (General Electric Co. Ltd.). The Illuminating Engineering Society was represented by its President for the past session (Mr. D. R. Wilson), Mr. J. S. Dow, Mr. A. Cunnington and Mr. J. L. H. Cooper. Two other members, Mr. L. E. Buckell and Mr. B. P. Dudding, also came up specially for the meeting, but were unable to do so in time to join the others at the Grand Hotel.

At the subsequent meeting, which was held in the Assembly Room of the Chamber of Commerce at 7 p.m., Mr. R. A. CHATTOCK, M.I.E.E. (City Electrical Engineer, Birmingham), presided. There was an excellent audience, the hall, which is stated to accommodate about 300, being almost completely filled.

In opening the proceedings the Chairman called upon Mr. D. R. Wilson to deliver the introductory address, which was as follows:—

INTRODUCTORY ADDRESS BY D. R. WILSON, C.B.E. (*President of the Illuminating Engineering Society*, 1927-28).

Before the main business of this evening begins I have been asked to make a short introductory statement about the functions and aims of the Society under whose auspices this meeting, the first that has been held in Birmingham, has been arranged.

The Illuminating Engineering Society was founded as long ago as 1909, mainly through the influence of Mr. Leon Gaster, whose unexpected death at the beginning of this year we all deplore, and is now nearly 20 years old, having remained in continuous activity up to the present time. The intention of the original founder was that the Society should appeal to the widest possible circle of interests, or, as Mr. Gaster himself used to put it, it was to be a Society of illuminating engineering, not a Society of illuminating engineers.

The Society is constituted in accordance with this principle. Close relations are maintained with a number of associations interested to a greater or less extent in illumination, including those concerned both with gas and electricity. Similarly, the Council initiating the policy of the Society is selected in such a way as to ensure adequate representation of these different interests.

The first point, then, to which I would invite your attention is that the Society is not exclusively technical. Certainly it contains amongst its members most, if not all, of the leading experts on illuminating engineering (using the term in its widest sense), but far the larger number of members consist of other professions, e.g., architects, physiologists, and industrialists, and of amateurs, like myself, who are interested rather than learned. It is, in short, an institution in which those interested in any of the problems of light and vision, whether as producer, seller, applier or consumer, can meet and interchange views on a common platform.

Next may I turn to what I feel are some of the advantages of members of this Society.

Let us take first the educational side. I think it will be generally admitted that close association between experts and intelligent laymen must be of direct educational benefit, not to one party but to both, especially when the experts, as Mr. Cooper's paper this evening will show, "temper the wind to the shorn lamb," and can on occasions like this use language that the average man can follow without difficulty. If then, as I have no doubt, there are many here who wish to learn more of the subject, I know that they cannot do better than join the Society.

Then again, there is the absorbing nature of the subject. The beauty of the phenomena of light, the definiteness and simplicity of the physical laws that govern it, the wonders of the eye, the mechanism by which we make use of light, both in structure and function, combine to give to the study of light and vision a peculiar fascination of its own, not exceeded by that of any other subject known to me.

Finally, there is the practical aspect. Perhaps we do not always realize how dependent we are on light and vision in our daily lives. Apart from music and conversation, there is hardly an activity performed by us or an amenity available to us in which a predominant and necessary part is not played by sight.

Again, we depend very largely on light for the avoidance of those dangers to which we are nowadays all exposed; whilst yet another practical aspect is the hygienic properties of light, not only as a germicidal agent but also, as in the case of the ultra-violet rays, as a curative and health-stimulating agent.

Lastly, it may not be out of place to remember that all of us are interested in yet another aspect, the financial one. We are all users of light, and of lamp fittings, and the more we know about them the more likely we are to get good value for our money.

The subject of to-night's meeting—factory lighting—should make a special appeal to an important industrial centre such as Birmingham. Through my association with the Factory Department of the Home Office and the Departmental Committee on Lighting in Factories and Workshops, I have had some opportunity of appreciating the complexities of the problem, and the vast scope for improvements, though there has admittedly been a great advance within recent years. In this field of lighting it is specially desirable that there should be interchange of experience between the lighting expert and the user, not only because it has been proved over and over again that efficient lighting is necessary for maximum production and maximum degree of safety, but still more because with the advance of knowledge improved and more economical systems are being

* See *The Illuminating Engineer*, January, 1928.

continually evolved, and full advantage of these cannot be taken without such intercourse. In my experience, indeed, there is already a general desire for information on the best methods of industrial lighting, and this our Society is endeavouring to satisfy.

These, then, briefly are some of the reasons why, on my submission, membership of the Society is well worth while. But, before closing, I should like to say what a pleasure it is to address on this occasion an audience in Birmingham. The Society, like many others, has its headquarters in London, and most of its meetings are held there. The present meeting is the first stage of an experiment—the holding of meetings in the large cities in other parts of the country. We have, in short, awoke to the fact that London is really quite a small part of Great Britain, and that there may be, and probably are, many people elsewhere who would be prepared to join us, but who know that owing to the distance they would seldom be able to attend meetings. Well, we are trying to cater for such people in two ways; in the first place by holding a series of meetings, such as the present one, in various large cities, at which we hope papers by local members may often be read; and, secondly, by offering membership at a reduced subscription to persons living outside London. The amount of this reduction has not yet been settled by the Council, but probably country members will have all the privileges of full members, including free copies of the excellent journal edited by my friend Mr. Dow, which contains a section devoted to our proceedings, the reason for a lower subscription being merely that a country member, for geographical reasons, cannot have quite the same full advantages as a town member.

I hope, then, that some of those present this evening will use this opportunity to join us at once, but I am not begging on behalf of the Society, which, I am glad to say, has never been in a stronger position than it is to-day. My motives this evening are purely altruistic, and all I want is to give everyone the opportunity to enjoy the advantages offered by membership of this Society as much as I have always enjoyed them.

Discussion of Mr. J. L. H. Cooper's Paper.

Mr. J. L. H. Cooper then read his paper entitled "An Investigation of Electric Lighting in the Engineering Industry."

The discussion was opened by Professor W. C. Cramp (Professor of Electrical Engineering at Birmingham University).

Professor Cramp said the subject was a very difficult one. They were dealing with something concerning not only the mathematics of electrical engineering but also psychology and physiology, and a number of other 'ologies which did not usually fall within the purview of the engineer. The subject was qualitative as well as quantitative.

He felt that the work which illuminating engineers were doing, and the work that the Society in particular was doing, should be of immense value. But it was at present only in its very early stages. He believed that he was right in saying that they were the first who had ever introduced any systematic measurement into the science of lighting. But, even so, although they had devised systems of illumination which had been used with considerable success, they were a long way yet from being able to say that such-and-such a system was best for any particular work.

The reason was this. They were concerned not only with illuminating intensity and uniformity: they were also concerned with the quality of the light, and, when he said that, he meant the bands of wavelengths which should be used for any particular purpose. In Mr. Cooper's paper there was no suggestion to manufacturers or to users as to the best quality of light for a particular purpose. Apparently Mr. Cooper would suggest 8 or 9 foot-candles as a satisfactory intensity in many instances. But 8 or 9 foot-candles could be obtained with a light whose spectrum approximated to sunlight, and also with a light which was a very long way from sunlight. As far as the workers were concerned there was a great difference between the two. They had seen and were constantly seeing more and more attempts to provide globes not only for obscuring and diffusing illumination but also to give a reasonable approximation to the familiar colour of sunlight or from a north sky. He felt it would be helpful if Mr. Cooper would give some information on such choice of globes and screens, particularly as regards colour.

He thought they must go gently, because the cost of the installation of lighting schemes was a very considerable item. Mr. Cooper had suggested that the cost—by which Professor Cramp presumed he meant the cost of electricity—was .86 per cent. of the wages bill. But those of them who were trying to help local manufacturers to put in schemes of lighting found that the percentage of cost was not what was troubling the manufacturer at all. The engineering trade as a whole, and in that district in particular, had been very badly hit indeed, and the real question constantly in the minds of the smaller manufacturers was this: "I can afford to spend up to, say, £300. Shall I buy a new machine tool or improve my lighting? With the former the increase in my output is precise; if I improve my lighting and do not put in a new machine tool the results are at least doubtful." That had been the difficulty during the last two or three years, and it would always be the difficulty which the manufacturer would present to the maker of fittings and to the consulting engineer every time there was a depression in trade. Figures of returns demonstrating the value of efficient lighting would be most useful in convincing the manufacturers. Those figures he did not find in the paper. If they could be collected by the Illuminating Engineering Society they would help forward a very desirable campaign.

There were some other difficulties with which the engineer constantly came in contact. For instance, Mr. Cooper had shown a slide which depicted lighting units that were correct and modern, but were wrongly adapted or placed. Professor Cramp had had cases of that sort, and he said he did not hold himself to blame. To begin with, they had an architect who did not consider the exigencies of artificial illumination. Then they were called in and asked to arrange the lighting conditions. They did their best, but they were not told where the machines were going to be placed. The result was that the machines were often planked down where the manufacturer thought he would have them, and he did not consider where the lights had been placed. It was an expensive matter once the lighting had been installed to move all the fittings, and he sympathized with the manufacturer because of the expense involved. Flexible systems of wiring for works were badly needed in this country. His experience in France, Switzerland, Germany and elsewhere was that the industrial lighting systems there were very much more flexible than in this country.

Then there was another difficulty up against which the engineer often found himself. It was that of the small manufacturer and the cost of effecting a change in his lighting system. He did not think that the cost of fittings was high. He thought manufacturers of fittings in this country were most reasonable. But he did sympathize with some works owners in regard to the cost of lamps. He had had experience in France and Switzerland, and he was compelled to say that he was surprised at the difference in price between England and the Continent in respect to metal-filament vacuum and metal-filament gasfilled lamps. He thought the Illuminating Engineering Society would be doing a great service, and would be helping very materially the modern lighting of engineering works, if they could use their influence to bring about a diminution in the price of lamps as sold in Great Britain.

Professor Cramp criticized Mr. Cooper's statement that small employers had improved their lighting system from information obtained in a casual manner or from someone who was aware of the firm's attitude in the matter of expenditure. He did not think that was quite fair, as, generally speaking, his experience had been that Midlands engineers were out to get efficiency at a reasonable price. It was not a question of expenditure

alone—it was a question of the firm's ability to afford one or two things, not both.

Professor Cramp concluded his remarks by asking Mr. Cooper what type of instrument he used when measuring the foot-candle intensity. He was sure, he said, that there were many present who would want to take measurements themselves. They appreciated immensely the effort that was being made to improve what was, after all, an essential matter for the health and well-being of the engineering industry.

Mr. F. BOYES said he was sure he was expressing the opinion of everyone present that the paper, and especially the slides, had been of tremendous interest and value.

Mr. L. E. BUCKELL described Mr. Cooper's work as a model of what a paper should be. He had incidentally revealed that illuminating engineering was not necessarily a matter of mathematical calculations and difficult formulæ. He felt that the subject dealt with was a full justification for the paper. There could be no question that the illumination of factories and workshops must be of vital importance. They were constantly being reminded that trade was not what it was, and it seemed to him to be a matter that needed the most careful consideration, whether the best results was going to be obtained by spending money on new machinery or on something that would enable existing machinery to be used to better advantage.

One very curious fact had been revealed by Mr. Cooper's paper. It had come out that, of the people Mr. Cooper saw, 56 per cent. thought that lighting was of very great importance; Mr. Cooper then went on to say that he found something below 40 per cent. of the factories were reasonably well lighted. It was worth while trying to find a cause for that discrepancy. It seemed to suggest that they had gone astray somewhere: it seemed to suggest that those factory owners had not been put in possession of information that would enable them to have good lighting in their workshops. That led him to make the point that it was up to illuminating engineers to do more in the way of educating factory owners than they had done in the past. He referred to one little step in that direction—the industrial factory and workshop lighting campaign being conducted by the E.L.M.A. and the E.D.A. The sole object of that campaign was to bring to the notice of owners of factories and workshops what good lighting meant, and to give them information that would help them to set up good lighting.

Mr. Cooper had pointed out that good lighting had its influence upon production; that it was of importance in regard to the health and well-being of the employees; and that it was of great importance in the matter of avoiding accidents.

He (Mr. Buckell) was not quite sure that Mr. Cooper sufficiently stressed the last of those three points. The extent of accidents seemed a very important thing. One slide had shown how by shadows falling on places where there was some kind of obstruction danger occurred. It was very true that the importance of good lighting as a preventative to accidents was often overlooked until after the accident had happened. It was not always sufficiently appreciated how expensive an accident was, not only in regard to compensation but in the disorganization of the work due to people being off for long periods.

He had often felt that one of the reasons why good lighting was not more prevalent was that the gentlemen who supplied the current did not altogether believe in bothering with lighting in workshops. They were more interested in getting a power load. He said that in cases where artificial lighting was similar in intensity to daylight it had been his experience to find that it was switched on earlier and earlier. It was a general experience that when really good lighting was installed in offices and premises the artificial light tended to be used for very long hours indeed.

Referring to colour in lighting, Mr. Buckell remarked that a great deal of good work had been done in that direction, but had perhaps not been sufficiently widely circulated. Correct colour values in artificial lighting seemed to him to be of very great importance in assisting vision. By the use of colour-discriminating lamps it had been very definitely shown that they made vision very much easier and much less of an effort, and therefore they got quicker and more accurate results.

That seemed to be of particular importance in connection with engineering works. The effect of colour-corrected light to enable various shades of grey to be discriminated was of very great importance. In the engineering industry they were dealing practically all the time with various shades of grey. He suggested this was one of the things to which it would be well worth while giving attention.

There was one other point. Mr. Cooper had not told them anything about the cost of daylight. They were accustomed to look upon daylight as one of the free things, but he thought it was often very far removed from that; when they had to design a building to let in the daylight it was often an enormous cost. In many cases they had to spend quite a lot of money keeping reflecting surfaces clean and in good repair. He thought it would be very helpful if they could have some little idea of the relative cost of artificial light and daylight.

He did not altogether agree with Professor Cramp in regard to the modern lighting of factories before the site of the machines had been fixed. In his opinion, this was not a very great difficulty, and he quoted a case within his own knowledge of a motor factory in the Midlands where the floor area ran into thousands of square feet. This factory had the whole of the lighting equipment installed and the current in use before the machines were put in, and it was afterwards found that the machines were perfectly well lighted.

The reason was simple, for the light was designed to give a uniform intensity, and illumination was obtained from at least three light sources at any one point. He agreed, however, that in factories for certain processes the matter might not be so simple.

Commenting on the increased production which followed improved lighting, he quoted a case within his own knowledge where the output went up 43 per cent. in three months following a change-over from the existing lighting equipment to modern lamps and reflectors. This point had also been emphasized in some leaflets recently prepared by the Industrial Welfare Council of the Printing Trade.

In conclusion, he hoped that the paper would be the means of rousing the interest of all present in illuminating engineering, and that they would associate themselves more closely with the Illuminating Engineering Society.

Mr. B. P. DUDDING emphasized the value of such meetings as these to the practical engineer, who was able to get first-hand information upon the many complicated details constantly occurring in an ever-widening field of activity. It would be a great thing, he said, if they could get the architects interested in illumination as part of their studies. Architects should join them in making the very best possible use of the most valuable asset.

Mr. PHILIP N. HEATH, one of His Majesty's Inspectors of Factories, was invited to express his opinions on the value of lighting as it affected accidents; he said that one of the things that had struck him in going round factories was the general question by employers when suggestions were made as to the cost and the effect upon output. It was his experience that employers had never thoroughly considered artificial lighting in regard to increased output, and he suggested this would be a profitable line of investigation. Better lighting, he said, would definitely have its effect upon the reduction of accidents.

Mr. G. W. INGRAM remarked that the lecturer had not said anything about the respective merits of direct and alternating currents, and asked if there had been any complaints about the effect of low-frequency A.C. circuits in factories.

The CHAIRMAN (Mr. R. A. Chattock), in winding up the discussion, commented upon the importance of simpler wiring for adaptation to all kinds of factories, and upon the importance of the quality of the light. It was essential to get the men who were handling light in factories interested in the proper methods. There was a general desire to make proper methods of lighting better known and more widely adopted in factories.

In reference to the suggestion that supply engineers were not very much interested in lighting, he assured Mr. Buckell that this was not so in Birmingham, where they were as keen on getting lighting as power. The fact that every factory that had power had lighting was proof of that.

Mr. J. L. H. COOPER, in reply, said he felt there had been a slight misapprehension as to the nature of his paper. It was not intended to be a general paper, but to present the results of a survey carried out in certain factories. He would have liked to have covered a wider ground, but found that was absolutely impossible in the time at his disposal.

Referring to Dr. Cramp's remarks on artificial daylight, he said he felt there was a great future for this type of illumination in the engineering industry, but he would not go so far as to reccommend artificial daylight as a general means of lighting. They had to remember that the absorption of the blue glass was somewhere of the order of 50 per cent, and therefore was a matter to be considered from the standpoint of economy. On the other hand, there were cases where artificial daylight could be profitably used all day long. In this country there must be dozens of small shops where such conditions applied. He quoted the case of a factory near Birmingham where buckles and all kinds of small articles were made. He was told that when the buyers called in the afternoon they had great difficulty in getting samples, or in getting articles to match the samples they took, because of the light. Consequently they had to make another visit on the following morning. This loss of time and money would be avoided if artificial daylight was installed. It was very difficult, under ordinary artificial light, to distinguish between highly polished and plated articles, and there again artificial daylight could be used to advantage.

His own view was that the lighting equipment formed part of the plant of a works, and should be considered as such in reckoning the cost. It had been proved over and over again that good lighting increased the production. Good lighting was just as important as a well-kept lathe or drilling machine, and they should aim at getting works managers to look at it from that point of view.

It was true that there was sometimes a lack of co-operation between the architect and the illuminating engineer, but he agreed with Mr. Buckell that lighting should be installed in a building irrespective of the placing of the machinery. That could be done successfully in 95 cases out of 100.

With reference to criticism of his remark that small manufacturers were often influenced by information obtained in a casual manner, he said it was his own personal observation that those who advised works employers had never looked at lighting from a production point of view. At the same time, he agreed that the economic factors of good lighting had never been properly investigated by the engineers. He had, he said, never heard of any complaints with regard to the use of low-frequency A.C. lighting.

Mr. Cooper concluded by showing the meeting the kind of instrument he used for measuring the intensity of lighting. It was, he said, an ordinary foot-candle meter.

In proposing a vote of thanks to Mr. Wilson and to Mr. Cooper, in which the meeting heartily concurred, Mr. CHATTOCK said the discussion had been very valuable, not only to illuminating engineers but also to users of light in factory and workshop. It would, he was sure, bear fruit in the future.

Manchester, October 29th

The meeting in Manchester was preceded by dinner at the Merchants' Restaurant (Market Street), where Mr. P. P. Wheelwright (Electric Lighting Service Bureau for the North-Western Province), and Mr. W. A. Shaw (ex-President of the E.C.A.), from Manchester, met the members of the Illuminating Engineering Society who had come up from London (Mr. J. S. Dow, Mr. J. Eck and Mr. J. L. H. Cooper).

At the meeting subsequently held in the lecture theatre of the Electric Lighting Service Demonstration Bureau for the North-Western Province, Mr. P. P. Wheelwright (chairman of the Bureau) presided.

INTRODUCTORY ADDRESS BY MR. JUSTUS ECK.

The introductory address on this occasion was delivered by Mr. JUSTUS ECK, who followed closely the lines of the address previously given by Mr. Wilson at the meeting in Birmingham. He briefly traced the development of the Illuminating Engineering Society in London, emphasizing the opportunities it afforded for exchange of views between lighting experts and users of light and the fascinating nature of the subject with which the Society had to deal. He alluded specially to factory lighting as a field where it was desirable to interest the consumer, and concluded by detailing the steps that were being taken to promote the extension of the work of the Society in the provinces, and by expressing the hope that a number of those present would become members.

Mr. J. L. H. Cooper's paper entitled "An Investigation of Electric Lighting in the Engineering Industry" was then read.

DISCUSSION OF MR. COOPER'S PAPER.

Mr. J. S. DOW, in opening the discussion, emphasized the need for definite data on industrial lighting. The statistics given by Mr. Cooper gave a clear picture of the present position of lighting in factories, and should serve to show where improvements were needed. He was particularly glad to see that those concerned in the present factory-lighting campaign had not confined themselves to advocating higher illuminations, but were also doing their utmost to eliminate such evils as glare. Managers of factories should realize that the provision of sufficient light was only half the battle; it was at least equally important that this light should be wisely used.

Mr. Dow remarked that the lighting of factories furnished a specially good example of the benefits of conferences between lighting experts and users of light. One could often get useful hints from the worker, and everything possible should be done to kindle his interest in illumination. The conferences arranged by the Home Office Factory Department with Joint Industrial Councils had had a most useful influence, especially in connection with the printing industry. He was glad to see present Mr. Lacey, who was associated with the firm who printed *The Illuminating Engineer*, and who, he hoped, would confirm the benefits of good illumination in the printing industry.

In conclusion, Mr. Dow referred to one special point arising from Mr. Cooper's paper—the field for local lighting. Mr. Cooper had rightly condemned the obsolete method of lighting based on pendent units at intervals, equipped with bare lamps in shallow conical reflectors. General lighting by means of scientifically designed units mounted high up out of the direct range of vision was much to be preferred to this method, and in most factories answered requirements well. There were, however, cases of special fine work which required well-shaded local units as a supplement to general lighting, either for the purpose of furnishing a specially high illumination or because the worker needed to alter the direction of the light whilst adjusting his material. Mr. Cooper would no doubt agree that this form of lighting was sometimes desirable.

Mr. R. C. HAWKINS (North-Western Province Lighting Service Bureau), in congratulating Mr. Cooper on his paper, mentioned that he had recently been visiting a number of engineering works and mills in Lancashire.

He had found that in many instances employers were not yet alive to the importance of good industrial lighting—perhaps partly because they had been accustomed to defective conditions for so long. On the other hand, he had come across excellent examples of modern lighting, notably in an artificial-silk spinning shed, where the increased production had been found by the manager to compensate amply the cost of the improved lighting system.

In his opinion, there was a great opportunity for the use of suitable forms of artificial daylight to supplement natural lighting—not only for the $2\frac{3}{4}$ hours per day mentioned by Mr. Cooper but for longer periods. There were many cases in which a light that "mixed" well with daylight could be used almost all day long.

The installation of better lighting did not necessarily mean spending more money. Where obsolete methods of lighting were in use much light was wasted. He recalled one case of a mill where the illumination had been increased three to five times, yet the consumption was practically unaltered. In conclusion, Mr. Hawkins pointed out that success in installing better lighting was to some extent dependent on the nature of the room and the arrangement of machinery. He referred to small machine shops, where much of the space was occupied by belting, pulleys and shafting, as a particularly awkward problem.

Mr. L. LACEY (Managing Director, Messrs. Taylor, Garnett, Evans and Co. Ltd.) said that he gladly took the opportunity of endorsing what Mr. Dow had said regarding the importance of good lighting in the printing industry. The Joint Industrial Council for the Printing Trades of the United Kingdom had taken a great interest in the researches on lighting conducted in London, and had made every effort to bring the importance of the subject to the notice of printers throughout the country. He believed that in general the lighting of printing works had been materially improved as a result of these efforts, and he felt sure that the Council would continue to do all they could to help the movement for better lighting in the future.

Mr. L. A. LUNN (Superintendent of Power Stations, Manchester Corporation) expressed his interest in Mr. Cooper's paper. He fully endorsed the necessity for improvements in lighting in all classes of workshops. Mr. Cooper had emphasized the importance of the subject from the standpoint of production, but the fact that better lighting reduced accidents to a minimum was equally important; on these grounds alone efficient lighting was well worth while.

Mr. W. A. SHAW (ex-President of the Electrical Contractors' Association and Chairman of the Manchester Branch of the E.C.A.) remarked that before better lighting could be introduced it was necessary to convince directors and managers of mills and factories, and this was by no means easy. Even when one was able to show that modern lighting would be advantageous and would in fact put money in their pockets it was difficult to get them to move. The data presented in Mr. Cooper's paper showed beyond doubt the scope for improvement. The campaign for better factory lighting should bring business to every section of the industry, as well as benefiting owners of factories.

Mr. J. D. NETTLETON also expressed the hope that the campaign would have fruitful results, though naturally some time should be allowed before the full results could be seen. He wondered whether engineers of electrical supply undertakings generally realized what a wonderful position they occupied in regard to effecting improvements in lighting. He believed that 70 per cent. of tradesmen accepted the borough electrical engineer as their "guiding star"; they regarded him not merely as a tradesman trying to sell them something, but as someone who was there to give service and advise them to the best of his ability.

Mr. W. FISHER agreed that the hardest part of the problem was to induce employers to adopt good lighting. On the other hand he had met cases in which employees had actually objected to improved lighting systems, with the result that the fittings had to be removed.

Mr. J. ECK agreed that owners of factories in this country were often conservative and required a great deal of persuasion before they would adopt new methods. On the other hand, once their support was secured they became firm advocates of better lighting. As an illustration he mentioned some experience in connection with the lighting of printing works. He recalled that originally there had been considerable difficulty in convincing compositors of the advantages of better methods. But at the present time the printing trade was perhaps one of those most keenly appreciative of the benefits of better lighting.

In the course of his remarks Mr. Eck threw upon the screen a number of slides illustrating factory lighting. One of the slides showed the results of the inquiry of the Illumination Research Committee into the lighting of printing works; it had been shown that about 20 foot-candles was needed before the full degree of efficiency of work was attained. Another slide showed the advantages of well-designed local units for special purposes—e.g., in revealing the interior of a cylinder which was being drilled.

Mr. W. BARRETT suggested that more attention should be devoted to the quality of light installed. He instanced one works which had adopted daylight lamps exclusively, and was unlikely to return to ordinary methods. He had adopted this form of lamp in his own home, with very beneficial results.

Mr. G. A. PROCTOR emphasized the value of the data presented in Mr. Cooper's paper.

The CHAIRMAN (Mr. P. P. Wheelwright), in winding up the discussion, agreed with what Mr. Shaw and other speakers had said in regard to the need for education. His duties as a supply engineer covered 24 hours a day all the year round; but he would do his best in the direction indicated by Mr. Nettleton. The outstanding point in connection with industrial lighting was the influence of the human factor. The extraordinary interest that had been excited in the effect of the rays of the sun, and the efforts that were being made to provide for access of solar radiation in modern factories, was yet another illustration of the wide appeal made by the subject. Improvements in factory lighting would react in many directions and would stimulate interest in other fields, for instance in the streets.

Mr. J. L. H. COOPER, in reply, thanked those present for the kind reception they had given him, and dealt briefly with some of the points raised in the discussion. In regard to the point raised by Mr. Dow he quite recognized that there were many special processes that required local lighting; but such lighting should be efficiently designed, and should be furnished as a supplement to general lighting. Several speakers had referred to the use of artificial daylight. It was quite true that there were many workshops which really needed some degree of artificial light almost continuously. He hoped that in time to come supply engineers would recognize this need by granting special terms for electricity supplied during the daytime. In such cases it was doubtless an advantage to have a light which mixed well with daylight, but not everyone liked the psychological effect of artificial daylight. In certain industries, where colours had to be judged, it was of considerable value. As an instance, Mr. Cooper mentioned the case of a chocolate factory where the girls found great difficulty in sorting the chocolates under ordinary uncorrected artificial light. When artificial daylight was installed these complaints ceased.

He wished to endorse the remark of Mr. Hawkins that the installation of modern lighting did not necessarily mean increased consumption of electricity. This should be pointed out to managers of factories. He would like to see efforts made to educate not only the management but also foremen and workers, who likewise benefited by better lighting.

A vote of thanks to the Author and the Chairman terminated the proceedings.

(A full account of the subsequent meetings in Newcastle and Glasgow will appear in our next number. ED.)

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

The 18th E.L.M.A. Illumination Design Course

Further lectures forming part of the eighteenth E.L.M.A. Illumination Design Course, now proceeding, were delivered during last month. Mr. L. Lingard and Mr. W. J. Jones have dealt respectively with floodlighting and general lighting problems, and a somewhat novel subject was covered by Mr. R. W. Maitland in his address on "architectural lighting." In the course of his lecture Mr. Maitland referred to the original methods of lighting shown at the Paris Exhibition of 1925, and the impetus which this exhibition gave to the embodiment of luminous devices as an essential feature of the decorative design. The author emphasized the importance of close co-operation between the architect and the illuminating engineer at an early stage of the design of buildings.

The audience were given an opportunity of seeing the new demonstration room at the E.L.M.A. Lighting Service Bureau, which is equipped to illustrate these novel methods of lighting. Some of the members of the Illuminating Engineering Society had a glimpse of this room on the occasion of their last visit to 15, Savoy Street. The main feature is the use of artificial skylights, luminous panels and friezes, etc., and altogether it should prove a highly novel and attractive exhibit.

The North-East Coast Lighting Service Bureau

We have received from Mr. E. S. Evans, the District Engineer, an account of the work conducted by the North-East Coast Lighting Service Bureau, which seems to have been exceptionally active during the past few months. Mr. Evans now acts as technical officer for the North Midland area in addition to the North-East Coast area, and has delivered addresses dealing with the factory-lighting campaign in over 20 cities during September and October. Further lectures to factory owners in the Newcastle district took place during the past month.

Meantime such subjects as shop lighting and domestic lighting are not being overlooked, and Miss Jackson, the able assistant who deals with the latter subject in Newcastle, has given numerous lectures before women's associations and co-operative guilds, etc.

In addition, the usual Illumination Design Course is also in progress, and a recent lecture in this connection was delivered by Mr. W. J. Jones on "Light and Visibility."

Sheffield Illumination Society

A very enjoyable evening was spent by a gathering of members of the Sheffield Illumination Society at the second of their whist drives, held on the 12th November, at the Corporation Lighting Department.

The President of the Society, Mr. J. R. Hall, presided and distributed the prizes, and was assisted by Mr. M. G. Lockwood in the capacity of M.C.

A Good Example of Drawing Office Lighting

There are probably few lighting problems that have been more discussed than the lighting of drawing offices. It was formerly argued that local lighting was necessary—partly because the requisite high illumination could thus be readily obtained, and partly because it was imagined that the draughtsman needed to manipulate the source so as to ensure that the light came from the correct direction and troublesome shadows from the edges of drawing instruments could be eliminated. The latter consideration has also led to indirect lighting being advocated.

Whilst there are doubtless still some draughtsmen who prefer the adjustable local light, it can be said with confidence that the position has been changed considerably by improvements in modern direct lighting units and in knowledge how to apply them. We are indebted to the Engineering & Lighting Equipment Co. Ltd. for the accompanying illustration of a drawing office lighted with "Lunax" fittings. The photograph was taken entirely by the light furnished by these lighting units and gives a good idea of the effect produced.

There is no glare from these diffusing fittings and no inconvenient shadows are experienced. The scheme was planned to give an illumination of 12.5 foot-candles. Actually 13.6 foot-candles were obtained. One feature which helps to explain the absence of troublesome shadow may be noted. The units are mounted at a height of 11½ feet and are spaced, on the average, 10½ feet apart. It should be understood that inconvenient shadow effects are almost inevitable if units are spaced too far apart and the relatively close spacing in comparison to the height of suspension in this case, no doubt, helps to explain the good results. It will also be appreciated that at a height of 11½ feet the units, though equipped with diffusing glassware, are well out of the direct range of vision.

Exhibits at the Opening Meeting of the Illuminating Engineering Society

(Held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, London, W.C., at 6-30 p.m., on Tuesday, November 6th, 1928).

THE series of exhibits on this occasion was exceptionally numerous, 14 distinct items, dealing with a wide range of devices, lamps, fittings and photometric apparatus, being included.

The first item on the programme was a demonstration by Mr. A. W. Beuttell of a new type of illuminated sign.

A New Principle in the Design of Illuminated Signs.

Mr. A. W. Beuttell remarked that the interesting feature about this "K-Ray" idea is that it solved completely one of our oldest problems in lighting, that is, getting sufficient light to the bottom of a picture to secure actually uniform illumination of it. It would be observed that this was done by placing in front of the

Fig. 1.—Front view of "K-Ray" Sign.

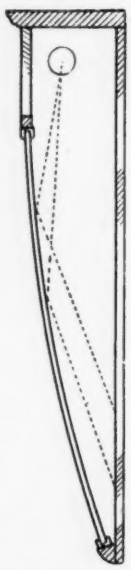


Fig. 2.—Side view showing reflecting effect of Glass Window.

picture a slightly concave glass window which acted as a transparent concentrating reflector. The light from the lamp, or lamps, concealed in the top interior of the case was thrown on to the inner surface of the window, which gathered up all the light and directed it evenly over the surface, the light being reflected on to the display from every part of the window. Thus, instead of enclosing a lamp in a reflector at a distance from the picture, one enclosed the picture itself in a reflector, which was, however, transparent. At the angle of incidence employed in the apparatus the glass acted as a highly efficient reflector, reflecting about 75 per cent. of the light falling upon it.

Mr. Beutell then produced a small display case. When the window was slightly opened at the bottom the beam reflected from the window was projected over the audience, so that the function of the window in acting as a concentrating reflector was clearly evident.

Mr. Beuttell next showed a larger apparatus displaying a double royal railway poster, 40 ins. × 25 ins., which also was illuminated equally from top to bottom. There was, in fact, no limit to the size of display that could be thus lighted.

The audience were shown a double-sided external hanging sign using the same principle. The light from a single row of lamps in the top interior was projected on to the opposed curved glass windows and thence on to the advertisement which was written on both sides of a central plate. The sign was most efficient, as the absorption in opal panels which occurs in the usual type of box sign was eliminated. There was also on view a sign of the transparent type, known by the name "Crystalite," with the advertisement on a clear glass panel. This type of sign could also be illuminated evenly up to any dimensions.

In conclusion Mr. Beuttell pointed out that the "K-Ray" invention had a very wide field of application, being applicable to the lighting of all kinds of flat displays such as signs, posters, nameboards, pictures, shop facias, wall-showcases and the like. It was, so far as he knew, the only existing method of satisfactorily floodlighting a shop facia.

Acetylene Lighting for Railway Work.

Mr. A. Cunnington (Southern Railway Company) said that the use of acetylene flares for lighting outdoor works had in recent years become quite commonplace, but a recent application of a somewhat unusual character carried out on the Southern Railway might be of some interest.

A length of permanent way had to be renewed and it was thought that instead of using a large number of independent flare lights it would pay to run out a pipe line from one or two generators and tap burners with conical reflectors into this pipe at intervals along the side of the track.

The experiment proved very successful and economical. A length of 300 yards was covered by 28 burners, and to feed this pipe line only two generators were required, placed at equal intervals. The total amount of carbide consumed in a run of six hours was only 36 lbs., a very great reduction on the amount that would have been required for 28 separate flares. Apart from economy, the convenience of this arrangement was a great improvement on the use of separate units where any ground work involving length without much breadth was involved. The system would be applicable to pipe or cable laying equally as to permanent-way work.

The diagram (Fig. 3) showed the general principle of the scheme, which was simplicity itself. The small pipe line was supported at intervals by spiked rods stuck in the ground and the whole apparatus could easily be moved by a few men. Each generator worked about 12 to 15 burners, but the groups were not isolated, the pipe

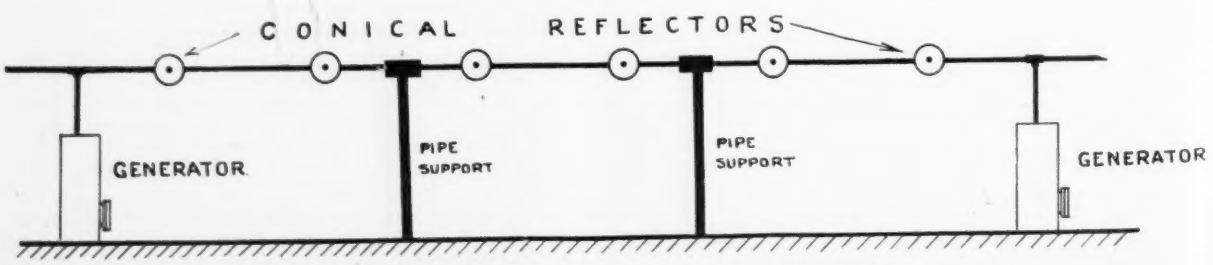


Fig. 3.—Showing Acetylene-Lighting Equipment for Railway Work.

FIG. 4.—A view of the Acetylene Installation on the Southern Railway.

line being continuous throughout. As only a ⅜ in. pipe was used it could readily be carried round slight obstructions and was very adaptable to local conditions.

He was indebted for the illustrations (Figs. 4-6) to Mr. H. M. Dobinson, one of the district lighting inspectors on the Southern Railway, who had developed this method of working acetylene flares.

A 10-KW. INCANDESCENT LAMP FOR THE FLOODLIGHTING OF AERODROMES.*

Mr. L. E. BUCKELL (General Electric Co. Ltd.) exhibited a new form of giant electric incandescent lamp, consuming no less than 10 kw., which had been specially designed for the floodlighting of aerodromes. Mr. Buckell pointed out the considerable technical difficulties involved in the design of so large a lamp, alluding specially to the problems involved in designing the leafing-in wires to take such a large current. Attention was also drawn to the special shape of the filament, which was specially designed to meet this requirement of illuminating evenly a large ground area.

NEW TYPES OF SPOTLIGHTS.

Mr. L. PRICE (General Electric Co. Ltd.) exhibited three new types of spotlights. The first of these, the "Baby" spotlight, utilized an aluminium casting in which the lampholder, mirror and its mount were assembled. Both are adjustable. The mirror is of 4 ins. diameter and of the Mangin type. The front of the housing has runners for carrying either an attachment for obtaining a small clearly defined spot of light, the size of which is governed by the insertion of metal diaphragms in runners provided for the purpose, or a plano convex lens for obtaining a wide beam of light. The fitting may also be used for flooding purposes by using the spotlight without either of the above attachments. Colour flooding or spotting can be effected by the use of glass colour screens. Glass is essential owing to the heat. The light source consists of a 500-watt Osram Class A1 tubular projector lamp with E.S. cap. Although primarily designed for stage purposes, this spotlight is equally useful for shop-window lighting, and is now being used extensively for this class of work.

* Some further particulars of this lamp, since furnished by Mr. Buckell, will be found on p. 358.

FIG. 5.—Daylight view: the system is installed on the far side of the track.

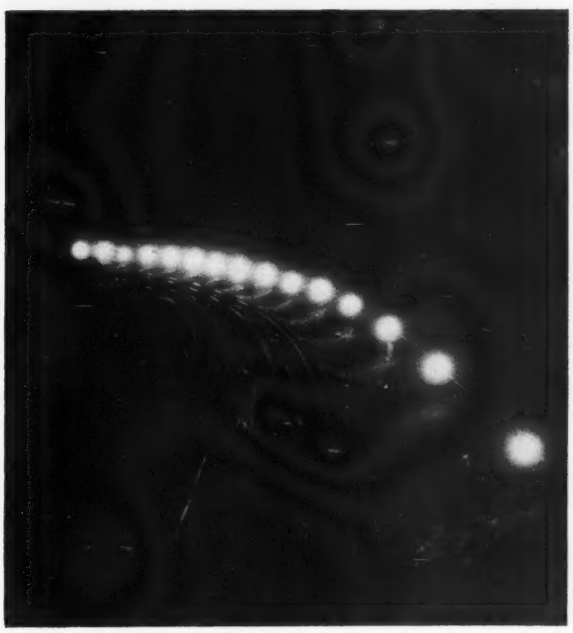


FIG. 6.—Appearance of the same section of the line at night, lighted by a series of Acetylene Flares.

The second exhibit, a new stage spotlight, has a body constructed of sheet metal with aluminium base and end plates, and is fitted with a 10-ampere locking-type plug and socket. The front carries a 6-in. diameter plano convex lens and is fitted with runners for a spotting attachment and colour frames. The interior is provided with a sliding tray on which is carried the lampholder and a 5½-in. spherical mirror. The tray is adjustable from the outside of the spotlight. The body is well ventilated by means of louvers in the top and holes in the base, both of which are suitably light baffled. Access to the interior is by means of a hinged door at the back and a hinged lid on the top. A 1,000-watt Class A1 Osram tubular projector lamp is used with this fitting. This type of spotlight is fast superseding the "Perch arc" or "lime" owing to its reliability and economy in current consumption.

In general construction, the third exhibit, the 500 to 1,000-watt batten spotlight, is very similar to the former one; it differs, however, in several respects, namely, it has a 5-in. diameter plano convex lens instead of 6-in., and has a universal type suspension arm instead of the usual tilting stirrup. It is designed to take an Osram Class B round bulb floodlight lamp of either 500-watt or 1,000-

watt size, as the spotlight has sometimes to work vertically downwards. It is somewhat smaller than the S.L. 400, and access to the interior is by means of a hinged door on the side. In practice a number of these fittings would be hung from a barrel immediately behind and above the proscenium arch, and each would be set to light up a definite action point.

A 30-amp. Long-Burning Flame Arc.

Mr. G. Tingley recalled that at the opening meeting of this Society three years ago he demonstrated a 10-ampere "Dia" arc lamp, which was then something new in the arc lamp design. Subsequent developments had proved that the arc lamp for street lighting was very far from dead. During the last three years very considerable progress had been made. The arc lamp was being increasingly used on the Continent, and likewise in this country and in Ireland. Moreover, the rating had been increased so that now D.C. lamps of 30 amperes and A.C. lamps of 18 amperes were being used both for street lighting and for the illumination of large buildings.

Mr. Tingley mentioned that there were on view two 30-ampere D.C. lamps which would be switched on shortly, but before doing so he would like to show one or two slides illustrating the construction of the lamp and its application. The first slide showed a sectional drawing (see Fig. 7) of a complete lamp. Attention was drawn to the shunt and series coils operating the balance arm which controlled the feeding mechanism.

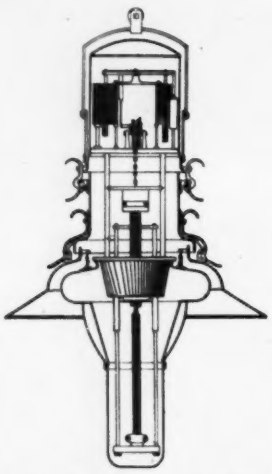


Fig. 7.—Diagrammatic view showing construction of "Dia" Long-Burning Flame Arc Lamp.

These were housed in the top of the lamp. Below a cast iron pot served as a guide for the upper carbon, and also had a machined metal face against which the corresponding face on the top of the inner globe bedded, to form a practically air-tight compartment, in which the arc burnt.

An interesting feature was the use of two globes, the inner and outer globe, with an air space between. The inner globe was of a somewhat complicated design, and was made in this way in order to ensure that there was no deposit due to the burning of the carbons in the central zone from which the light was emitted. The large annular space at the top of the globe was at a lower temperature than the central zone, and consequently all the fumes were condensed therein in the form of a white deposit; the central zone, being air-jacketed by the outer globe, remained at a considerably higher temperature than the annular space. The narrow portion at the lower part of the inner globe accommodated the bottom carbon holder and the two guide rods. This lower portion was protected by a sheet steel outer cover. He particularly wished to emphasize the simple construction of the lamp.

Some technical data regarding the properties of the lamp might be of interest. The 10-ampere lamp absorbed 550 watts, including the resistance, and the mean hemispherical candlepower was 2,200 Hefner candles. In the case of the 15-ampere D.C. lamp the energy absorbed was 825 watts, and the mean hemispherical candle-power 3,300 Hefner candles, the watts per Hefner candle being thus between 0.2 and 0.3 in each case.

In the case of the 30-ampere lamp the energy absorbed was 650 watts, the mean hemispherical candle-power 8,000 and the consumption about 0.21 watt per Hefner candle. This lamp, therefore, thus furnished the highest candle-power attained in any single street-lighting unit in use at the present time.

A slide of an installation of 10-ampere lamps in Leipzigstrasse in Berlin was next shown. On the left-hand side were the famous Wertheim stores, which would correspond, for instance, to Selfridges in London. This

Fig. 8.—A view taken from the terrace of the Museum, showing the lighting of the famous Augustusplatz in Leipzig by Long-Burning Flame Arc Lamps.

building was illuminated from above by 30-ampere D.C. lamps. The lamps were suspended at a height of 66 feet, and there were 43 lamps in all, burning four in series on 220 volts. Another slide showed a store with a number of 10-ampere D.C. lamps suspended from a roof to illuminate the façade and upper part of the building.

A final slide showed the appearance of the famous Augustusplatz in Leipzig. In this large square there were twenty-four 30-ampere lamps, mounted in pairs on reinforced concrete posts 56 feet high. There were six posts along one side of the square, five along the opposite side and one in front of the university building. The lamps were connected four in series on 220 volts D.C., the distance between the rows was about 400 feet, giving a spacing ratio of 7 : 1. Between the lamps in the rows the distance was 105 feet, giving a spacing ratio of 2 : 1, while the distance between the rows and the adjacent building was 100 feet. The average illumination beneath the lamps in the rows was about 3 foot-candles, and at the greatest distance, that is, 200 feet from either row, the minimum illumination on the ground was 0.5 foot-candle. The cut-outs and substitutional resistances for the lamps were housed in the base of the posts and the wiring was carried inside. The lamps were suspended from "Kandem" strain release couplings and raised and lowered by "Kandem" self sustaining winches.

He thought it would be agreed that according to these figures the long-burning flame arc was still one of the most efficient illuminants for street lighting. It might be of interest to mention that a number of these lamps could now be seen in operation in the streets of Dublin.

In conclusion, Mr. Tingley showed two of the 30-amp. long-burning flame arcs in actual operation. The lamps were of imposing size, and it was explained that, owing to the large current taken, some time should be allowed to elapse after switching on the lamp in order to enable the full candle-power to be obtained.

Prismatic Plates for Panel Lighting.

Mr. E. Stroud exhibited the 1928 models of the prismatic plates developed by the Holophane Company, which have special application to shop windows, art galleries, hospital operating rooms, skylights, cove lighting, floodlighting, electrical fountains, photographic studios, and similar problems.

The plates are made in 12-inch squares and of several types, giving different forms of light distribution. Thus one type of prismatic plate (No. 755) has concentric prisms arranged to form a lens having a 5-inch focus. For the best results, the smooth side of the plate should be towards the light source. The distance of the lamp centre above the plate may be varied from $2\frac{5}{8}$ to $5\frac{1}{2}$ ins. The lower limit gives a wide diffused beam, the upper limit a sharp narrow beam. The lamp centre may be placed eccentric to the lens a maximum of $1\frac{3}{4}$ ins. when it is desired to throw the light out at an angle from the plate.

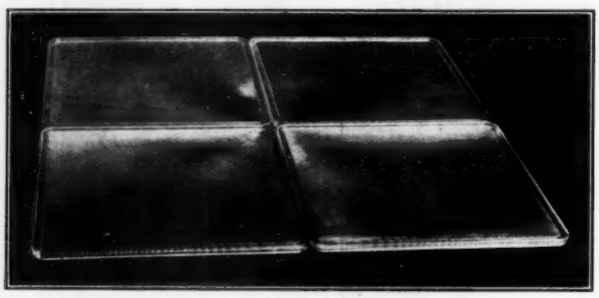


Fig. 9.—Specimens of the New Holophane Prismatic Plates (No. 756).

Another prismatic plate (No. 756) has quarter-concentric prisms arranged when used in groups of four to form one lens having a 10-in. focus. The distance of the lamp centre above the centre of the assembled lens may be varied from $5\frac{1}{4}$ to 11 ins., the lower limit giving a wide diffused beam, the upper limit a sharp narrow beam. The lamp centre may be placed eccentric to the lens a maximum of $3\frac{1}{2}$ ins. to obtain a beam at an angle from the plate. The metal framing members separating the plate segments of a lens should not exceed $\frac{1}{8}$ in. in thickness.

Yet another prismatic plate (No. 752) has diagonal prisms arranged to throw the light out at an angle to the perpendicular axis of the plate in the direction shown by arrows moulded into the glass. The distance of the lamp centre above the plate may be varied from $3\frac{1}{4}$ to $5\frac{1}{2}$ ins. If one lamp is to be mounted over a number of plates the limits in position of the light centre will bear the same relationship to the combined area as to the above figures, i.e., one lamp over four plates should have the filament not lower than $6\frac{1}{2}$ ins. or higher than 11 ins. over the plates. For the best results the prism side of the plate should be towards the light source.

To control the maximum quantity of light flux, the lamp should be equipped with a suitable reflector, the complete equipment being, therefore, reflector, lamp and lens. With these prismatic plates great possibilities are opened in the control of light when employing panel or kindred systems.

The next four items on the programme served to illustrate progress in photometry. Three different types of illumination photometers, all very simple and compact in design, were shown by Mr. E. Stroud, Mr. Russ and Mr. G. Herbert, and Mr. Tippell gave a demonstration of a new form of spectrophotometer.

New Types of Photometers.

The Holophane Lumeter.

Mr. Stroud also exhibited the 1928 models of the Holophane Lumeter. Two types of this familiar English portable photometer are now manufactured corresponding to the two ranges of instruments mentioned in the B.E.S.A. Specification No. 230/1925. In both of these instruments the scale is now evenly divided and a bluish filter is incorporated between the comparison lamp and the photometric screen, thus making the light from the lamp within the instrument a colour match with the illumination from lamps of normal efficiency, and greatly facilitating the obtaining of a photometric balance.

The new Range "A" lumeter, with a direct scale of 0 to 0.2 foot-candles, has been specially designed for testing street lighting and a secondary scale up to 2 foot-candles is obtained without the use of neutral filters.

This instrument, together with the Holophane test surface holder, forms a complete equipment (see Fig. 10) conforming in all respects with the B.E.S.A. Specification for Range "A" Photometers.

The low-reading calibration is obtained by means of a removable cap fitting over the comparison lamp. This is shown, removed, in the front of the illustration. When the cap is in position a definite proportion of the light from the comparison lamp is absorbed and the instrument reads in accordance with the engraved scale (0 to 0.2 foot-candles). By removing the cap a secondary scale of 0 to 2 foot-candles is obtained which will cover the remainder of the range of illumination intensities likely to be met with in street lighting. In addition to these two scales, neutral filters are provided operating in the path of the light from the illumination under test. These enable the scale to be multiplied by a further 10, 100 or 1,000, so that this one instrument can be used for all values up to 2,000 foot-candles.

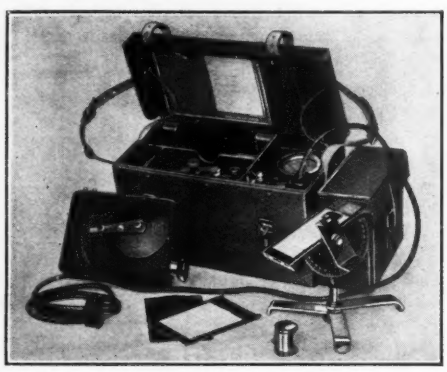


Fig. 10.—Showing the chief parts of the Holophane Lumeter (1928 Model).

The great advantage of this new design is that low readings as well as high readings are covered by one instrument without the need of keeping the extremely low field brightness called for by the low readings throughout the whole scale, and a wide range of values is covered without the need of neutral filters.

This new lumeter is specially adapted to the needs of city corporation lighting departments, etc., who require an instrument which can be used with equal facility and accuracy for demonstrations in their electricity showroom and for testing the street lighting for which they are responsible.

The test surface holder shown in the illustration has already been described in this journal, but it will be noticed a collapsible three-arm stand can now be supplied to enable the test surface to be kept as near the actual street surface as possible, in conformity with the recommendations of the B.E.S.A. Specification for Street Lighting (No. 307/1927). This device facilitates the taking of "normal" or "horizontal" illumination tests and is provided with devices for measuring both the angle of incidence of the light and the angle of inclination of the test surface.

The new Range "B" lumeter, complying with the B.E.S.A. Specification for Range "B" Photometers, has a direct scale of 0 to 20 foot-candles which can be multiplied by 10 or 100 or divided by 10. This range is suitable for general purposes, such as the testing of illumination in interiors, etc.

This instrument more nearly replaces the lumeters of previous years, the higher direct scale being, however, more in keeping with the illumination intensities met with in modern practice.

The Philips Foot-Candle Meter.

This new illumination photometer was exhibited by Mr. RUSS, who pointed out the extreme simplicity of the apparatus. (See Fig. 11.) As will be seen from the illustration, the instrument utilizes a series of spots of graded brightness, so that the observer can determine the point of balance without having to make any manipulation. Light is afforded by a small lamp at one end of the scale which is operated by two dry batteries connected in series. A novel feature is the ingenious expedient whereby the voltage of this lamp is maintained constant by means of a control lamp within the instrument, so that no voltmeter or regulating resistance is used. All that is necessary is to press a small button,

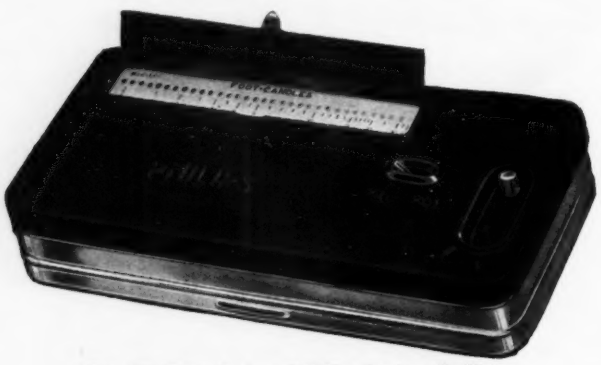


FIG. 11.—General view of Philips Foot-candle Meter.

when the lamp lights up at the prescribed voltage, and then to inspect the row of spots and determine the point of equality of brightness. The range of measurement covers 0.1 to 45 foot-candles.

The instrument is very compact, and is relatively inexpensive, and is specially suited for use in cases where a quick demonstration of the value of illumination is desirable.

The Benjamin Lightometer.

Mr. G. HERBERT, who demonstrated the Benjamin lightometer, pointed out that this instrument was also of a very simple and convenient type. As the instrument is based on the cosine law, a considerable range of value (1 to 30 foot-candles) is possible with a relatively small movement. (If the inverse square law were utilized the corresponding range would be only 1 to 10.) Despite the concentration of the scale, it has been proved that accuracy is not impaired, and the above range suffices for the measurement of all illuminations usually found in interiors. Since, however, in the case of street lighting, considerably lower values have to be measured, each instrument is provided with a certificate stating the current at which the reading is to be divided respectively by 10 or 100. The correctness of these ratios can be easily checked by measuring at a selected illumination by both methods—e.g., a reading of 1.5 foot-candles, measured direct, may be compared with the reading obtained (which should be 15) when working on the 1/10 scale.

The photometer disc is of the grease-spot type, and the surface is protected by a very thin layer of glass. It has been found that accuracy is maintained even when the light strikes the photometric disc at a great angle of incidence. Incidentally the glass protecting disc has the advantage that the observer can note the direct reflection of a light source, and thus deliberately avoid conditions which allow such direct reflections to occur; errors in readings due to specular reflection are thus largely eliminated. The lamp is regulated by the aid of a rheostat and ammeter—the ammeter being preferred to a voltmeter for the reason that any uncertainties arising from imperfect contacts are thus avoided.

The Hilger-Nutting Industrial Spectrophotometer.

Mr. TIPPELL (Messrs. Adam Hilger Ltd.), in demonstrating this instrument, remarked that the relative spectral distribution of energy in a light source is important to the illuminating engineer, both from the point of view of the suitability of a light source for a given purpose and as a criterion of the colour of the source for those uses which require the adoption of definite signalling colours. The Hilger-Nutting industrial spectrophotometer enables a series of comparisons between the intensity of the source to be examined and some other standard source to be made at predetermined intervals in the spectrum.

The apparatus, which is assembled on one well-designed metal base, consists of a constant-deviation wavelength spectrometer in association with a modification of the Nutting type of polarization photometer. The two light sources pass into the latter by separate similar paths and recombine is such a way that two spectra corresponding to them are seen in close juxtaposition in the eyepiece of the spectrometer. By means of sliding shutters a band of the spectrum of any desired width can be isolated, the mean wavelength of the band being indicated on a conveniently placed engraved-scale drum attached to a fine screw motion rotating the prism table. Rotation of a circle on the photometer alters the relative intensities of the two spectra so that they can be rendered equal in intensity. This circle, which is controlled by a small knob adjacent to the observer, is engraved with two scales, which may be easily read without the observer having to move from the eyepiece. The one scale is engraved in angular degrees, the other in densities, a measure which applies to the determination of the absorption of transparent materials, for which purpose the instrument is primarily designed

$$\left(\text{where } D = \log \frac{I}{I_0}\right)$$

but is readily converted to the ratio of the two sources

$$\left(\frac{L_1}{L_2} = \frac{I}{\text{Antilog } D}\right)$$

by a very simple calculation.

A suitable comparison source must be chosen, and it must be constant and easily reproducible. This question is discussed in some detail in a booklet published by Adam Hilger Ltd., and entitled " The Determination of the Relative Spectral Distribution of Light Sources by the Hilger-Nutting Spectrophotometer," and the Hefner lamp is recommended, while data concerning its relative spectral distribution are quoted.

FIG. 12.—The Benjamin Lightometer.

The comparison of the two sources is made at a number of points in the spectrum, and from the values obtained for their ratios at these points, when related to the known values of the comparison source, can be obtained the relative spectral distribution of the light source to be examined.

Time did not permit of the manner of setting up the light sources being described in detail, but the technique is neither very difficult nor very troublesome, and those interested may be referred to the booklet mentioned above.

Floodlighting and other Lighting Units.

Mr. Ives (Metro-Vick Supplies Ltd.) demonstrated a variety of lighting units of special interest, being a new range of units designed to meet practically all the requirements of modern floodlighting. He drew attention to the mechanical design permitting universal

Fig. 13.—A Bracket Unit Silverstone Shade.

adjustment. A special mounting device enables these units to be quickly installed in any desired position. Single, dual, triple or quadruple mountings are possible; units may be clamped to a flat surface or may form a wall bracket on a pedestal as required. Each of these floodlights is equipped with a lamp-focussing adjustment and with heat-resisting glass.

Mr. Ives also illustrated, by means of lantern slides, the wide variations in beam characteristics that can be obtained by the use of rectangular diverging glasses, diffusing-glass or clear-glass cover.

The next item was the "Whiteway" street-lighting unit, which has been previously described in this journal, and must be familiar to most of our readers. It may be recalled that this is a totally enclosed diffusing-glass unit of pleasing contour, supported on a gallery of novel design. Such units are regarded as specially suitable for use in imposing thoroughfares, in parks, and on bridges where decorative appearance is of special importance.

Finally, he exhibited a series of units utilizing Silverstone glassware. A pleasing type of enclosed pendant unit is shown in Fig. 14, whilst Fig. 13 illustrates a simple type of wall bracket. A particularly interesting item is the pendant fitting shown in Fig. 15, which is specially recommended for use in hospitals. A special feature is the arrangement permitting the canopy to be lifted, so that it is unnecessary for the glassware to be removed when lamps are replaced or the glassware is being cleaned.

In the case of all these units attention was drawn to the good diffusing effect produced, the absence of glare and the ease with which they could be maintained in good condition.

(Since these pages were prepared for press we have received from Messrs. Metro-Vick Supplies Ltd. some further illustrations and data relating to the floodlighting units mentioned above. We hope to make use of this in our next issue.)

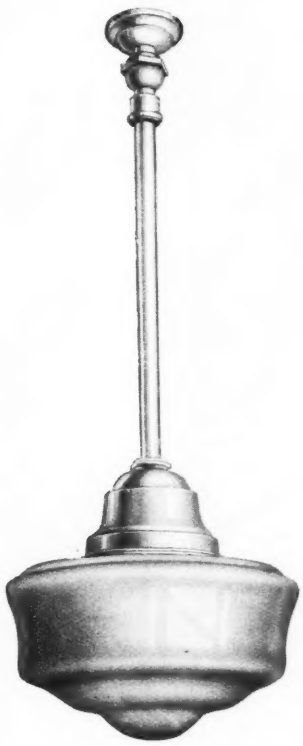


Fig. 14.—A Pleasing Pendant Diffusing Unit.

Fig. 15.—"Hospital" Unit, showing removable canopy.

Fig. 16.—The "Duplexalite" Fitting.

A Novel Indirect-lighting Unit.

Messrs. A. W. Zelley and F. Blake (L. G. Hawkins & Co. Ltd.) exhibited several attractive units. The most interesting of these, shown in Fig. 16, was the "Duplexalite" indirect-lighting unit, which has one ingenious feature—a dense glass disc at the base of the reflector proper which is not only luminous itself but also directs light upon the outer surface of the reflector. Thus the somewhat "flat" effect of totally indirect-lighting units with an opaque reflecting unit is eliminated. By suitable choice of materials very pleasing colour contrasts can be embodied in the design. The low surface brightness renders this an agreeable and inconspicuous unit.

Another type (the "Scientific" unit) was of very compact design, and is available either in a form suitable for mounting direct on the ceiling or as a pendant fully enclosed fitting. The form of unit for direct mounting on the ceiling consists of a diffusing-glass bowl, an upper white glass canopy and a reflector of crystal glass connecting the two. The unit is thus entirely closed and easily cleaned. For use under ordinary conditions white diffusing glass may be adopted, but the unit is also constructed with bowl and canopy in various varieties of decorative glass, giving a graceful, but at the same time economical, effect.

The unit is also readily adapted, by the use of a special blue-tinted glass, to furnish artificial daylight.

Pointolite Lamps and Accessories.

Mr. Greetham (Edison & Swan Electric Co. Ltd.) exhibited some typical examples of "Pointolite" lamps and accessories for use therewith. The latter require special design according as they are to be used with the smaller lamps (30 candle-power and 100 candle-power) or the larger lamps (500 candle-power and 1,000 candle-power).

Mr. Greetham recalled that in its early days the Pointolite lamp was considered purely as a valuable adjunct for certain scientific work, and the resistance boxes, therefore, were designed on the assumption that they would be operated by skilled technicians. For several years, however, the lamp had been increasingly used as a light source for optical apparatus used in industrial plants, and it became apparent that certain modifications could advantageously be introduced, thereby increasing its value for both laboratory and industrial purposes.

The first results of this work appeared some months ago in the form of a new type of resistance unit for use with either 30 or 100 candle-power lamps. This was constructed on sound mechanical lines. The unit consists of two elements: (*a*) A polished slate-topped base containing the necessary wiring and carrying upon its upper surface the usual ioniser switch, and three asymmetrically disposed sockets, which serve to make connection with corresponding pins on the resistance unit (*b*). The lampholder and adaptor are permanently connected to the base by the usual flexible leads. (*b*) A resistance unit of tubular form having a perforated steel cover and containing the necessary resistances for the ioniser and arc circuits.

The base (*a*) is common to both 30-candle-power and 100-candle-power lamps and the resistance elements are supplied for use on any of the standard voltages, and with either type of lamp. If at any time it is necessary or desirable to change the supply voltage or substitute a 100-candle-power for a 30-candle-power lamp, or vice versa, this is simply effected by plugging in the required resistance element.

Similar new devices have been adopted for the 500-candle-power and 1,000-candle-power units. As in the case of its smaller brother, one size of box is used for both sizes of lamp. The structure is almost entirely of steel plate, and carries at one end a specially designed switch. This switch is of rotary pattern, having four positions. The first three positions correspond to the three on the present type of switch; the fourth is an "off" position. In this position all connections to the lamp are dead, and it is perfectly safe to handle the lamp or holder without any fear of shock. The resistance elements, which are replaceable, are similar to the bars commonly used in electric fires. These bars, of which there are five, are numbered to indicate their position, and carry marks showing the supply voltage and size of lamp with which they are to be used. In the event of accidental breakage any bar or bars can be obtained separately and installed within a very few minutes. Also the resistance elements may be changed, if it is desired, to accommodate the other size of lamp.

Ample ventilation is provided by means of perforations in the steel cover.

A Novel Type of Diffusing Unit.

Mr. Calvert (Siemens Electric Lamps and Supplies Ltd.) exhibited the Siemens "Ultralite" fitting, which is a new design of enclosed lighting unit embodying several new features designed to improve the efficiency of this type of fitting. (See Fig. 17.) In place of the usual metal canopy a glass top is provided, thus increasing the efficiency of the unit and eliminating the dark shadows which are unavoidable when using a metal canopy. Maintenance cost is reduced to a minimum since it is unnecessary to dissemble the fitting for the purpose of cleaning or lamp replacement. The globe is ventilated by the provision of air holes in the base of the glass top placed in such a manner that the ingress of dust is checked. It can be said that the fitting is practically dustproof.

Fig. 17.—The Siemens "Ultralite" Fitting.

A further feature is the method of suspension adopted to avoid fracture of the glass. The holes in the globe are melted, and in the process a rim is formed round the hole. The base of the bowl mount is recessed to conform with this rim, and when secured in position the screwed shank of the bowl mount is centred through the whole, avoiding contact with the glass. Felt washers are used in preference to leather, as the former are more resilient and do not harden under heat.

Three-ply glass is used for both the globe and the top.

A New Type of Metallic Dimmer.

Mr. L. G. Applebee (Strand Electric and Engineering Co. Ltd.) exhibited an entirely new type of metallic dimmer, which is of very robust construction. It consists of a number of Pherro-iron alloy plates mounted on suitable framework. Conduct of these plates is made by means of a phosphor-bronze brush. Thus, about 60 conducts are made for each dimmer ensuring no flicker in the lights from the dimming operation. The wheel gear for working the brush has special features and operates through a wheel carried on shafting by means of a locking device. The handle of the dimmer can be operated individually or locked to the main shaft with other dimmers, so that they can all be raised or lowered together as one bank by means of a master wheel. In addition, slow motion applied by means of a worm drive may be connected or disconnected to the shaft by means of a lever operation. Also, by means of a special locking device, one shaft may be locked to the other. These dimmers have only been introduced for six months, but have already been installed at a number of theatres.

The Treph Lighting System.

Mr. C. T. Payn explained that he had been asked to exhibit several examples of the Treph lighting fittings, which were based on the invention of Mr. Poul Henningsen, of Sweden. The object of the inventor had been to secure complete screening of the filament of the gas-filled lamp from the eyes of observers, but at the same time to do so with a minimum loss of light and to reflect the light where it was needed in the most efficient manner.

The design had been evolved from the familiar type of office bell shade. The path of the reflected rays within such a bell shade could be regarded as comprising three main sections, and the arrangement of shades adopted in this fitting corresponded to this division. The unit consisted of three concentric shades placed one above the other. The filament of the lamp was arranged to fall at the centre of the combination and the light of the lamp was reflected from the underside of the shades, which were of matt material. The contours were so designed that the rays of light struck these surfaces at an oblique angle and were fully reflected.

The wide upper shade reflected the light which would usually be largely lost in the upper regions of the ordinary reflector, and the under-shade represented the lower region, which had been brought in towards the centre in order to facilitate the reflection of light from the upper and middle shades. The light which would normally be lost in passing through the translucent material was not wasted in this fitting, which was essentially a reflecting system, the main distribution of light being downwards and outwards. Moreover, a plain-glass lamp could be used.

Mr. Payn then exhibited a pendant fitting designed for a 200-watt lamp. Owing to the large area of the reflecting surfaces, there was no glare and it was impossible for the filament to be seen at any angle. The inefficiency of this type of fitting, as determined by the National Physical Laboratory, was 69 per cent. The general distribution of light was such that, with opal glass, a circle approximately 1.3 times the mounting height of the lamp was illuminated.

The units were made in three main types, utilizing respectively opal and frosted glass, and metal shades, white oven-lacquered, the interior of which could be finished either in matt silver or in gold.

Fig. 18.—A View of the Treph Lighting Unit.

A "Front-of-House" Lantern.

Another theatrical exhibit by Mr. Applebee was a special "Front of House" lantern, constructed of planished steel and double cased, with heavy trunnion. This is fitted with P.C. Lerne iris and barn-door shutters, which are operated by levers situated at the rear of the lantern. The arc is of heavy construction, having five movements. With these special attachments a gradual fade-away or quick black-out can be obtained. This lantern is specially suitable for front-of-house work, and is of special use in cinema boxes where a spotlight is required from a very long throw. The lantern can be fitted with two lenses, one for spotting and one for flooding, the lenses being charged by a single movement, if desired.

The Largest Electric Lamp in the British Isles

Since the foregoing pages were completed we have received some further particulars of the 10-kw. incandescent electric lamps, which are stated to be the largest made in this country, and which were exhibited at the opening meeting of the Illuminating Engineering Society, on November 6th. The filament of this lamp, which is manufactured by the General Electric Co. Ltd., is housed in a 400-mm. diameter bulb and arranged in double-grid formation, each grid consisting of six "V's," this construction having been adopted to secure a wide and even distribution of light over a large area. One of the chief constructional difficulties has been the successful conduction of such a high current (125 amps.) through the pinch. This has been carried out by the use of specially constructed platinum thimbles in the glass pinch.

The efficiency of this lamp is 0.67 W/M.S.C.P., and the mean spherical candle-power is 15,000. When used with a 4-ft. diameter parabolic mirror the beam candle-power is approximately 4,000,000.

In exhibiting this lamp to a meeting of the outside representatives of the G.E.C., on November 18th, Mr. L. E. Buckell explained that it was receiving considerable attention commercially, notably by the British International Pictures Ltd. in their sun-arc apparatus at Elstree in the production of British-made films, and also by the Air Ministry in the lighting of Farnborough Aerodrome. A photograph was shown depicting the whole Farnborough Aerodrome adequately illuminated by one such lamp.

Dualite Glass

Truly the variety of fittings and glassware available to the illuminating engineer is becoming almost bewildering. Amongst the firms who have entered this field is Dualite Ltd. In the course of a recent visit we had an opportunity of inspecting some of this diffusing glassware. Mr. Eric Student, who is associated with this firm, we believe ranks as an originator in this special field. He pointed out the good qualities of Dualite glass, which is based on the use of two layers of white glass with an intermediate layer of clear glass of exceptional purity. The light attained by the use of this glassware, which is distinctly whiter than that penetrating through ordinary opal, is stated to be exceptionally restful to the eyes and to have good colour-revealing properties. It is, accordingly, proving very acceptable for use in shops and offices.

In Fig. 1 we reproduce a view of one of the standard units; in Fig. 3 a new departure—the application of Dualite glass as a diffusing element in trough fittings; attention may be drawn to the special device enabling plates of this glass to be readily inserted and removed. The other illustration shows something different—a novel decorative fitting of the stalactite type. These are only a few typical fittings selected from those on view at the premises of Dualite Ltd., at Bartlett's Buildings. We hope shortly to be able to supplement these examples by views of installations in which they are used.

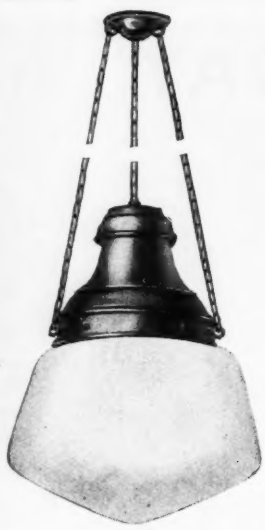


FIG. 1.—A Standard Form of Diffusing Unit.

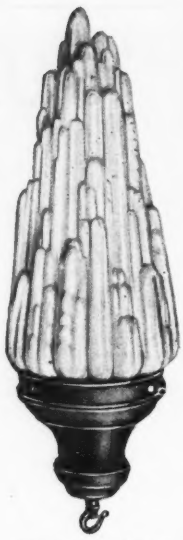


FIG. 2.—An Original "Stalactite" Unit.

Other Lighting Literature

Much other literature awaits out attention. We have before us some sheets from the latest catalogue of "Hailware" "Hailglassware," based on the use of three-ply opal glass, and a catalogue from Messrs. Falk, Stadelmann & Co. Ltd. listing outdoor lanterns, floodlight projectors, etc., which invites comment. We shall refer to these and other items in our next number.

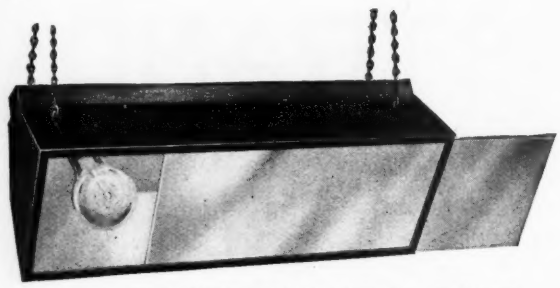


FIG. 3.—Trough Reflector, with Diffusing Glass withdrawn.

INDEX (December, 1928),

THE ILLUMINATING ENGINEER

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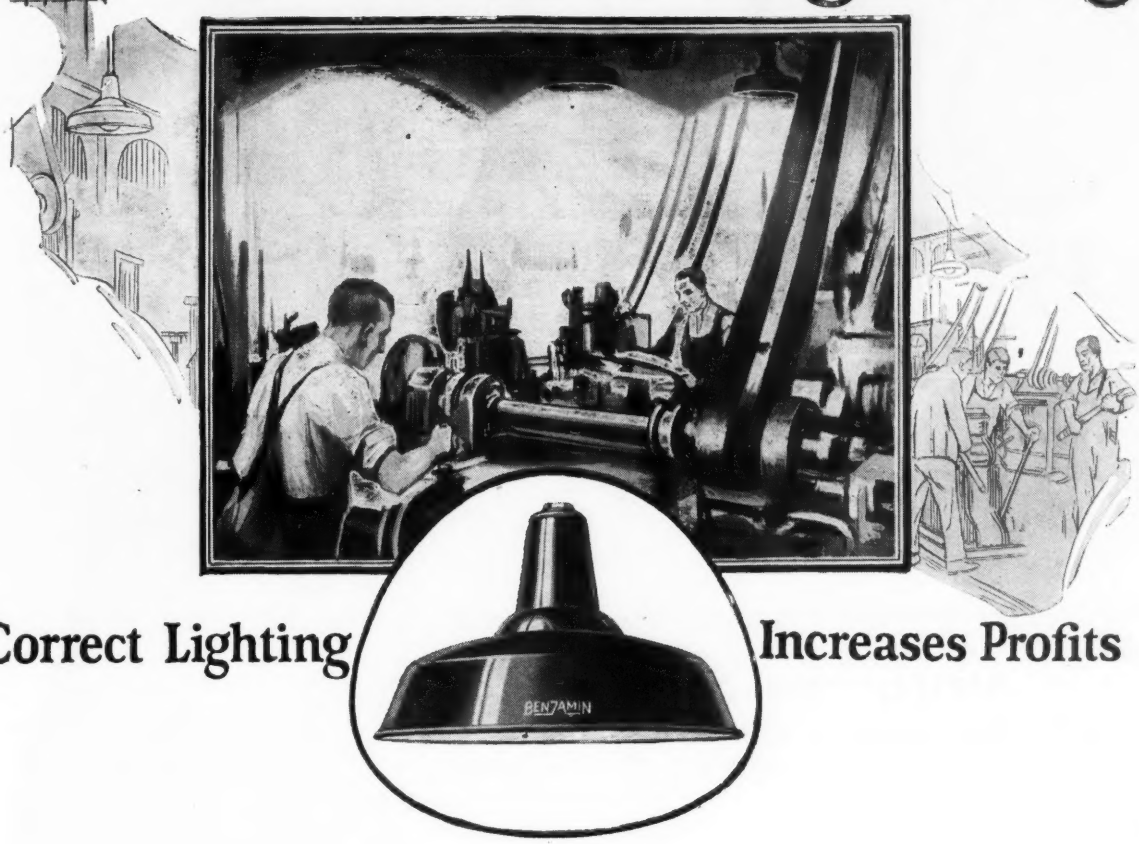

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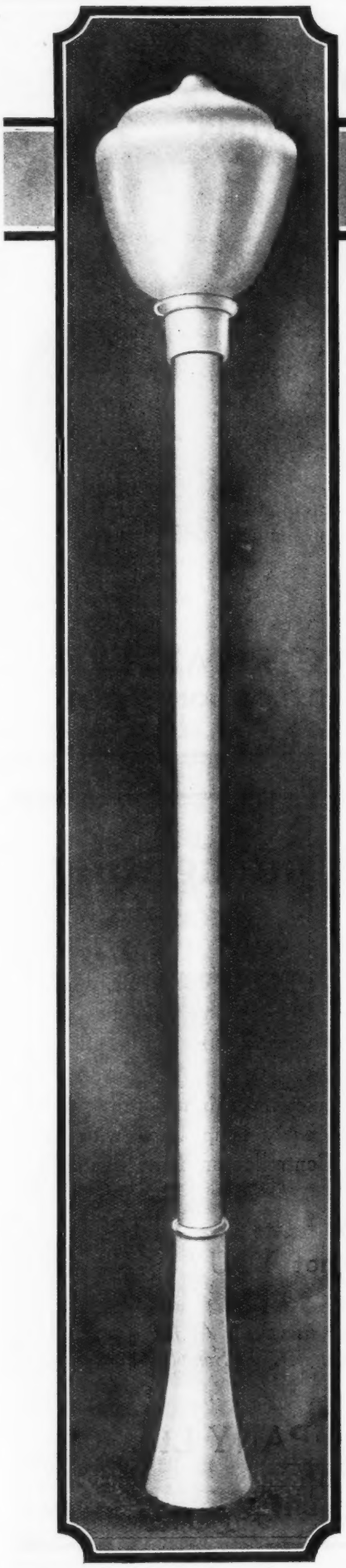

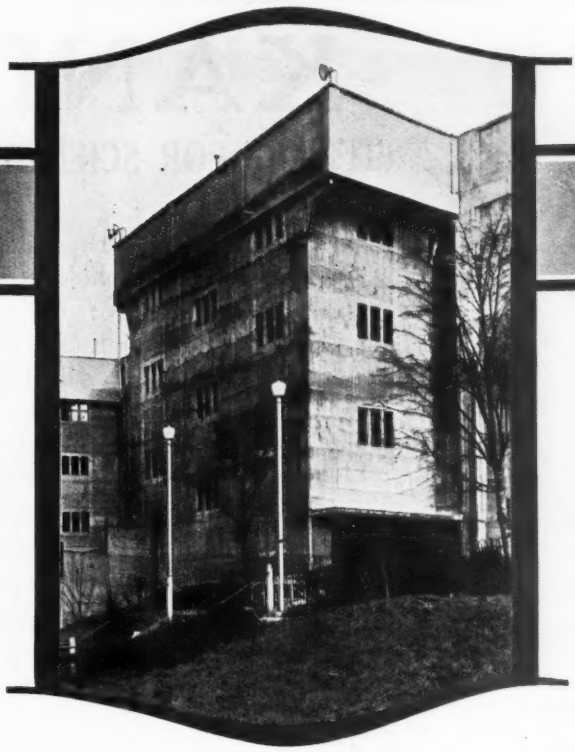

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